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SILVER JUBILEE

OF K.C.DAS
BANGALORE

COMMEMORATIVE SYMPOSIUM

ON

INTEGRATION OF MODERN & TRADITIONAL TECHNOLOGIES IN THE MANUFACTURE OF HIGH QUALITY INDIGENOUS PROCESSED FOODS

HELD ON

SATURDAY THE 4th APRIL 1998

At CSIC Seminar Hall
CSIC Complex
Indian Institute of Science Bangalore.

Organised By

Association of Food Scientists and Technologies (India) Bangalore Chapter

Sponsored By :

K. C. Das Private Ltd.
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Preface

Traditional foods of India have developed over centuries through experience of many cultures and include a large variety of processed food products which are popular all over the country. The Symposium on " Integration of Modern and Traditional Technologies in the Manufacture of high quality Indigenous Processed Foods" was held on 4th April 1998 at Bangalore, by the Association of Food Scientists and Technologists (India), Bangalore Chapter, to celebrate the 25th Anniversary of Messrs K.C.Das (Private) Limited, Bangalore who are among India's pioneering and leading manufacturers of high quality traditional confectioneries and savouries. Messrs K.C.Das (P) Limited started their business in Calcutta nearly four generations ago. Over these past many years, they have developed many original products among which is the famous "Rosogolla." The ultimate Indian sweet which has put Indian confectionary on the global map.

The Symposium was held over four sessions on 4th April, 1998. It was attended by leading food scientists, technologists and industrialists who spoke on selected subjects and also presided over the sessions (listed in the appendix). The total number of participants were 160.

The AFSTI thanks all the participants and those who worked for the success of the Symposium which was sponsored by Messrs K.C.Das (Private) Limited, who deserve the highest appreciation, for their continued commitment in excellence in quality in developing and manufacturing a varity of indigenous processed food.

Symposium on Integration of Modern and Traditional Technologies in the Manufacture of High Quality Indigenous Processed Foods.

The above symposium was organized on the occasion of the 25th Anniversary of the K.C. Das enterprise in Bangalore by the AFST Bangalore Chapter on 4th April 1998. The main objectives of the symposium was not only to assess the cultural, social and nutritional importance of traditional foods but to place their manufacture on a modern technological foundation for raising their quality, production economics and measuring shelf life in order to meet the new challenges evolving from changing consumer needs.

The symposium consisted of four sessions.

" Innovations in Processing Technologies".

"Quality Aspects of Milk and Other Raw Materials."

"Nutritional Aspects of Traditional Food".

"Adaptation and Development of Appropriate Systems for the Packaging of Indigenous Processed Foods".

About 160 scientists, technologists, post-graduate students of Bangalore University, the University of Agricultural Science and managers, especially from the small and medium scale traditional food industries, participated in the symposium. Among the eminent participants were Dr. B.N. Mathur, (Joint) Director Research, N.D.R.I., Karnal; Dr. V. Prakash, Director C.F.T.R.I. ; Dr. P.A. Shanker President A.F.S.T. (I) Bangalore Chapter; Mr. R.N. Das, Governing Director of M/s. K.C. DAS (P) Ltd. ; Dr. N.C. Ganguli, Secretary, National Academy of Agricultural Sciences; Dr. Vijaya Lakshmi Purushottaman of the Avanashilingam (Deemed) University for Women from Coimbatore and other active food scientists and industrial technologists from Karnataka. All this was made possible due to the initiative of M/s. K.C. DAS (P) Ltd., (Bangalore branch)

Dr. H.A.B. Parpia, former Director of Planning & Evaluation of the United Nations University and former Director of C.F.T.R.I, inaugurated the symposium. In his speech he highlighted the fact that food processing industry in India was responsible for employing 19% of the industrial labour force and generating 18% of industrial GDP in India with only 5.5% of the total investment in industry. It was a very important industry that stimulated agricultural production to meet rising consumer demand for processed and preserved foods of high quality that are required in the country today. With rapid urbanization, a large part of our population needs food products with long shelf life. This industry therefore has the potential to bring about a real socio-economic transformation by preventing large scale wastage of food and saving the energy used home cooking.

Dr. Tara Gopaldas, former Dean of Department of Home Science at the Maharaja Sayaji Rao University, Baroda delivered the Keynote Address. She spoke of the changing need to overcome trends in food consumption profile vis-a-vis food and nutritional deficiencies. She particularly emphasized the several effective and low-cost options for micronutrient fortification of food for which traditional products can be among the best carriers and strongly urged the development of a systems approach for integration of traditional and modern technologies in the preparation of indigenous foods.

Mr. R. N. Das, Governing Director of M/s. K.C. DAS (P) LTD., gave an interesting insight into the historical development of Bengali sweets over the last thousand years. His illuminating talk highlighted the socioeconomic and philosophical factor which influenced the development of this tradition, culminating in the relatively modern paradigm of the quintessential Bengali sweet- the "Rossogolla".

Dr. V. Prakash, Director CFTRI, in his address sought to explore the interrelationship between entrepreneurship and innovation, which involves the management of technology to create greater opportunities for building new business.

His analysis of the innovative process and the product matrix, along with the factors that influence these processes concluded with reiteration of the vital importants of developing a total quality management system for the creation of safe indigenous processed foods.

Dr. B.N. Mathur, Joint-Director (Research), NDRI, Karnal began with a field to consumer integration of indigenous milk products and processed and the positive impact of each one of these components on the other. Moving on to a SWOT analysis of the industry, he elaborated on the technological requirements for this industry in diverse areas of operation from product-profile, process mechanization to packaging. He concluded with a brief overview of recent innovations and future needs of the indigenous milk-products industry and recommended increased mission oriented R & D for this total system.

Dr. A.M. Natarajan, Retd. Prof & Head of Department of Microbiology, NDRI Bangalore, and Consultant, K.C.DAS (P) LTD. concerned himself with the microbiological aspects of milk (used for processing) from source to final consumer. He emphasized the paramount importance of monitoring the quality of milk at source, outlining the microbial contamination profile of milk including efforts at elimination of the hazardous life forms. He concluded with an interesting presentation on the continuing experimentation at M/s. K.C. DAS (P) LTD., on extending the shelf life of canned Rossogolla. His main objective using milk as an example was to illustrate the importance of the quality of raw material as a sine quanon for production of high quality processed foods and maintenance of their shelf life.

Dr. N.C. Ganguli, former Professor of Eminence, ICAR and Secretary, National Academy of Agricultural Sciences, began with an account of diverse bio-chemical and chemical entities which integrate to form milk. He then explained about the important role which milk coagulation plays in the manufacture of Indian tradtional dairy products and the unique characteristic behaviour and the environmental ambience in the generation of new molecules in milk.

Dr. Vijaya Laskmi Purushotaman, professor, Avinashilangam Institute for Home Science and Higher Education (Deemed university) for women, exhaustively covered in her address the high nutritional value of traditional South Indian diets of individual people. She also gave illustrations of the health protection and therauptic uses of traditional foods. She regretted that modern, urban society is gradually losing its traditional skill base and said that the benefits of such preparations need to be protected. She felt this would need elimination of time consuming processing techniques, and drudgery that goes with it. There is need for simplification as well as standardization of recipes to conserve time and energy and ensure higher shelf life.

Dr. Vijaya Rao, Senior Scientist, DFRL, spoke of the modernisation of traditional technologies in the manufacture of indigenous food products. After analysising the "why" and "how" of integration of tradition and modernity, she concluded with a couple of case studies illustrating the successful upgradtion of technology used in the manufacture of traditional items like "bhujias" and "laddus". She also emphasised the importance of training the human resource and building a quality rating system to enable better absorption ot technology.

Mr. H.B.N. Murthy, Consultant on packaging, in his address, spoke at length on packaging material and systems. He emphasised that though packaging cost depended on the required function, It was affected by the increased standard of living, which influenced the packaging economics, as it impinged on shelf life required.

Mr. Arup Sengupta discussed the "why" aspects of packaging followed by a discussion of ecofriendly packaging. His message was to lay emphasis on practicing "Reduce, Replace and Re-use" while promoting "Return" and "Re cycle". He concluded with a brief overview of developments in the barrier qualities of material and technology, stressing the development and use of biodegradable packaging.

At the symposium, fourteen students who had worked in the laboratory of M/s. K.C.Das (P) Ltd., were also recogonised for their contributions. The company has encouraged research students to work on important indigenous and allied foods and by offering its laboratory facilities and technical help to the students of local colleges affiliated to Bangalore

University who have worked under the guidance of Dr. A.M. natarajan, Prof. Agnes, Prof. Sakuntala Mane and Dr. Sulia.

In all the 14 post graduate students from Bangalore University college, Maharani's College and Home Science College completed their diessertation work at the K.C. Das laboratory during 1996 & 1997.

The various areas in which students carried out research work include,

1.HACCP on selected channa based sweets.

2.Increase in the shelf life of canned Rossogolla.

3. Preservation of Misti-dahi at Room Temperature and in Cold Storage.

4. Microbiological quality of indigenous savories.

5. Evaluation of detergents and sanitisers for adoption in indigenous sweet industry.

6. Efficacy of different treatment & filtering system for water purification.

7. Microbial contamination of the atmosphere in the food Industry and control measure etc.

The fourteen students who received a token award from Sri. R.N. Das, the Governing Director of K.C.D as (P) Ltd., were

M. Phil:

1.Mrs. Navaneetha (1996) 2. Mrs. Roopa (1996)

MSc.

1.Ms. Aradhana (1996) 2. Ms. Bindhu Damodharan (1996) 3.Ms.Champa(1997) 4. Ms. Meenaskhi (1997) 5. Ms. Ratna (1997) 6. Ms. Nancy (1997) 7. Ms. Jamuna (1997) 8. Ms. Usha (1997) 9. Mr. Rajesh (1997) 10.Mr. Yughandar Reddy (1997) 11.Ms. Padmansini (1997). 12.Ms. Kumuda.(1997)

The focus of the symposium was mainly on the ways and means of raising the quality and shelf life of food products and upgradation of the levels of hygiene and safety. This included development of better and more economic means of packaging, use of shelf life extenders, including bio-preservatives, raising productivity in manufacture and increasing efficiency of management through greater use of science and technology which included development of better machinery and sophisticated high quality products.

The symposium also emphasized the need for creation of in-house R & D centers by the industry as well as increasing co-operation with research institutions for product development and for training of staff which should become a continuous process to keep abreast of competition at home and abroad.

The role of this industry will assume much greater importance with the policy decision of the Government of India to double food production in the next 10 years. All of this increased food supply will have to be protected, preserved and processed to prevent heavy losses, both qualitative and quantitative, as a means of further increasing food availability by saving atleast the 20-30% which is lost at present due to inadequate storage, handling, protection, preservation and processing. This increase in food supply is without additional stress on natural resources such as land and water, the availability of which on per capita basis is reducing every day.

All the four sessions of the symposium were chaired by eminent personalities in the processed food industry and research. It included Dr. K.T. Achaya,CSIR Emeritus Scientist (Retd.), Dr. Chenna Gowda, Managing Director K.M.F. Bangalore, Dr. K.K. Iya, (Retd.,) Director Animal Sciences (ICAR) New Delhi, and Dr. Arya, Director DFRI, Mysore. The Concluding session of the symposium, presided over By Dr. H. A. B. Parpia came out with the following specfic recommendations for actions:

Integration of Modern & Traditional Technologies in the manufacture of high quality indigenous processed foods.
Recommendation for Action :

1. Manufacture and consumption of traditional Indian foods has contributed over centuries to peoples' nutrition and sound health. In order to increase its production and gain greater consumer confidence, the technology used for manufacture of these foods need to be upgraded to meet changing needs. People are demanding quality and greater safety with longer shelf life. It has also become necessary to meet the rising demand, created by the cultural transformation taking place mainly due to accelerated urbanisation and the changing role of women.

2. Technologies for manufacture of traditional foods must be upgraded by

(a) Adaptation of existing modern equipment and machinery to processing needs, and

(b) Development of new equipment and machinery as a continuous effort to prevent obsolescence and to keep the industry competitive. This will need upgradation of technological competence for the design and manufacture of equipment to serve in particular the small and medium-scale entrepreneurs.

3. Special efforts are needed to produce suitable raw materials, whether of plant or animal origin, for processing to ensure that finished products of better quality can be manufactured. The raw materials developed must adopt themselves better to mechanical operations or vice-versa for ensuring production efficiency and quality. This will need much closer co-operation between industrialists, agriculturists and research institutions.

4. Development research should be undertaken by the industry adapt new and especially non-conventional raw materials for the manufacture of traditional foods, of improved quality with longer shelf-life.

5. In-house research and development work should be strengthened by the industry to create new indigenous products with attractive names to meet the needs of consumers of traditional products. This can also be done through industry supported cooperative projects in existing R & D institutions. For this purpose the industry should make full use of the incentives provided under taxation laws by the government.

6. A special programme of research should be undertaken to bring about an increase in the shelf-life of traditional foods using improved and new processing technologies as well as safe, indigenous natural food protectants, including natural bio-preservatives. Attention should be given particularly to the development of exotic and attractive packaging through integration of traditional and modern packaging materials. These materials should be environment friendly, e.g., basketware and pottery with lamination.

7. Priority attention should be given to drawing-up standards for traditional food products and for ingredients used in them, by the BIS,CCFS, agricultural universities and R & D institutions.

8. Representatives of traditional food processing industries should be appointed as members on the governing councils and research advisory committees of R & D institutions to forge closer links between this vital economic sector and the research needed to keep it competitive.

9. Facilities for adequate training and re-training, especially of middle level personnel, should be created for the industry. This should include raising of their management capabilities. This training should be combined with product-development research and plant-operation practices.

10. Development grant should be given by the government to the industry directly, or through their associations, to carry out surveys of potential market demand and changing consumer needs so as keep abreast of the requirements both at home as well as for export.

11. There is scope for much greater use of germinated grains to raise the nutritional value of processed traditional foods. This must be explored on priority as products based on them are more urgently needed as weaning foods and geriature foods.

12. Traditional foods lend themselves as the best products for fortification with micro-nutrients, particularly minerals and vitamins to prevent nutritional deficiencies.

13. Special attention should be given to the development and manufacture of traditional foods for vulnerable groups such as children, pregnant women and lactating mothers, etc. On their health depends the future of national productivity and progress.

14. A financing system should be created for accelerating the progress of modernising the traditional small and medium-scale food industry. Low interest development loans should be provided to them, as in the case of agriculture. This will stimulate production of improved agricultural raw materials, for manufacture of high quality products, and will generate more employment both in agriculture and industry. In future this will increase rural employment, and help to reduce population migration to the cities.

15. A policy must be formulated by the Central and State Governments to develop and protect traditional food industry for prevention of its take over by large national and transnational monopolies.

16. A sound but flexible development strategy, free from bureaucratic control, must be formulated jointly by the industry with the Central and State Governments to speed up the development of this capital-saving, employment-generating and poverty-reducing sector of the economy which already accounts for 60% of the processed foods manufactured in the country.

17. Elimination of tax burden on this industry through removal of the taxes on the raw materials such as packaging materials used by traditional food industries, and of sales tax on finished goods, will help to bring them within the reach of large number of consumers.

18. Every effort should be made to establish direct contact between the raw materials producer and the processor to eliminate the middle man in the interest of the consumer and the industry. This will encourage investment by the processor in production of high quality raw materials and also to increase crop yields.

DETAILED PROGRAMME SHEET

"Integration of Modern & Traditional Technologies in the Manufacture of High Quality Indigenous Processed Foods"

1. ***Registration & Welcome Tea*** — ***2.00 - 2.30 P.M.***

2. ***Inaugural Session*** — ***2.30 - 4.00 P.M.***

- Invocation
- Bouquet Presentation
- Welcome Speech
- lighting of the Inaugural lamp
- Inaugural Speech
- Memento Presentation
- Speech by Sri. R.N. Das
- Award of Medals to Research Scholars
- Key Note Address
- Presidential Remarks
- Vote of Thanks
- Closing Ceremony

3. ***High Tea*** — ***4.00 - 4.20 P.M.***

4. ***First Technical Session*** — ***4.20 - 5.20 P.M.***

Topic : "Innovations in Processing Technology"

Chairperson : ***Dr. K.T. Achaya***

Speakers : 1) ***Dr. V. Prakash,*** Director, CFTRI
"Innovative Matrix in Technology Management"

2) ***Dr. B.N. Mathur,*** Joint Director, NDRI
"Technological Aspects of Innovative Processing"

Protocol

- **Session Coordinator inviting Chairperson & Speakers to the dias**
- Presentation of Bouquets to them
- Introduction of Chairperson & Speakers
- Chairperson's introductory remarks
- First Speakers Presentation
- Second Speakers Presentation
- Chairpersons concluding remarks
- Vote of thanks & presentation of Memmentos

5. *Second Technical Session* — *5.20 - 6.20 P.M.*

Topic : "Quality Aspects of Milk"

Chairperson : ***Dr. H. Channe Gowda, MD, KMF***

Speakers : ***1) Dr. A.M. Natarajan,*** *Consultant*

"Microbial Quality Aspects of Milk from Cow to Consumer in Relation to Indigenous Products"

2) Dr. N. C. Ganguli, *Consultant*

"Chemical Hand Shake Among Milk Molecules to Influence Quality of Milk"

6. *Third Technical Session* — *6.20 - 7.20 P.M.*

Topic : "Additives & Protectants"

Chairperson : ***Dr. K. K. Iya, DDG, ICAR (Retd.)***

Speakers : ***1) Dr. Vijaya Lakshmi. P.***

Head & Professor

Avinashilingam Deemed University,

"Value of Traditional Foods in Nutrition"

2) Dr. (Mrs.) D. Vijaya Rao

Head - Food Technology, DFRL

"Modernisation of Traditional Technologies for the production of quality indigenous foods"

7. *Fourth Technical Session* — *7.20 - 8.20 P.M.*

Topic : "SUITABLE SYSTEMS FOR THE PACKAGING OF INDIGENOUS PROCESSED FOODS"

Chairperson : ***Dr. S.S. Arya, Director, DFRL***

Speakers : ***1) Mr. H.B.N. Murthy,*** *Consultant,*

"Packaging Economics & Engineering"

2) Mr. Aroop Sengupta,

Head - Packaging, HLL

"Ecofriendly Packaging Materials for Packaging of Indigenous Foods".

9. *Question & Answer Session* — *8.20 - 8.45 P.M.*

10. *Plenary Session* — *8.45 - 9.00 P.M.*

Chairperson : ***Dr. H.A.B.Parpia,*** Consultant

11. *Dinner* — *9.00 P.M.*

Inaugural Session

Welcome Speech by President AFST Dr. P.A. Shankar

Inaugural Speech by Dr. H.A.B. Parpia

Speech by Shri. R.N. Das

Keynote Address by Dr. Tara GopalDas

Presidential remarks by Dr. H.A.B.Parpia

Welcome speech by Dr. P.A. Shankar President AFST, Bangalore Chapter

A Hearty Welcome to participate in A half - a - Day Symposium on

"Integration of Modern & Traditional Technologies in the manufacture of High Quality Indigenous Processed Foods"Saturday, 4 April 1998

at CSIC Seminar Hall, CSIC Complex, Indian Institute of Science, Bangalore.

Organised by:

ASSOCIATION OF FOOD SCIENTISTS & TECHNOLOGISTS (INDIA) - Bangalore Chapter

No. 109, ADA Ranga Mandira, J.C. Road, Bangalore Phone /Fax : 3414848, 3343676

Sponsored by

K.C.Das

Bangalore

The charm of every human society and its sustainability lie in its culture. One of the most important components of this is the culture of nearly forty societies that have evolved over thousands of years to provide us balanced appetising diets to meet our nutritional needs. Although these valuable foods and the art of their preparation began at home they have evolved into commercial commodities and their sales are 30-50 times more then those of all the western style processed foods put-together.

The demand pattern of these foods, which are based on cereals, grain legumes, roots, tubers, milk and marine products, is changing fast with urbanisation and living conditions. The consumers are getting more conscious of quality, appearance and need for longer shelf life. The marketing radius has changed from local to national. The processed traditional foods have moved from home to restaurants and from there to commercial production as ready-to-eat and ready-to-cook foods of convenience. This rapid change calls for a radical change in the mode of their production through adaptation, design and development of appropriate modern machinery and equipment as well as for changes in the basic technologies and even raw materials for making traditional foods.

Recognising the urgency for stimulating the need for changing the pattern of production of traditional foods and their marketing, the Ministry of Food Processing Industries financed the organisation of five workshops in different regions of the country to understand their needs to modernisation. The recommendations made by these needs to be taken up by R&D institutions for their implementation, otherwise they will remain embedded in reports or on the library shelves gathering dust. In order to give a practical shape to them the professional bodies of Food Scientists and Technologists and the enlightened traditional food industries must initiate development that would place the industry on a modern foundation. Recognising this urgent need AFST (I) Bangalore Chapter has taken the initiative on the occasion of 25th Anniversary of Messrs K.C.Das (Private) Limited, who are pioneers in this industry, to organise this symposium with their financial support. It is hoped that the symposium will, through its Four Technical Sessions, initiate the much needed action to achieve the objective.

Inaugural Speech of Dr. H.A.B. Parpia

Dr. H.A.B. Parpia
Former Director of Planning & Evaluation
U.N. University, Tokyo and
Former Director of CFTRI, Mysore

It is my pleasure to be with you today to inaugurate this Symposium on Integration of Modern and Traditional Technologies in the Manufacture of High Quality Indigenous Processed Foods. This has become a subject of high priority in the country as the manufacture of traditional processed foods is 30 - 50 times that of all western style processed food put-together. Its modernization is most essential in order to place it on a sound techno-economic foundation. Traditional processed foods emerged from home and went into the domain of "Halwais" and restaurants. Manufacture of these foods grew with the changing needs but the same household techniques were used to set up tiny industries which began to grow. The next step was to commercially manufacture a few tonnes of these products per day to meet the needs from rapid urbanization of societies. Yet the technologies used to manufacture still remained quite primitive even at the level of medium scale. To meet the accelerated consumer demand for these delicious and nutritious foods arising across the board by the "unity-in-diversity" of foods and the culture change that is taking place in urban areas, we need better technologies based on scientific knowledge and modern equipment to manufacture our indigenous processed foods. Recognizing this, the Ministry of Food Processing Industries organized five Workshops in different parts of the country at Coimbatore, Mumbai, Ludhiana, Hyderabad and Calcutta on this important subject in 1996 and also an international workshop which brought together several developing countries of Asia and Africa to share the traditional knowledge of their processed foods so that we could exchange the valuable information accumulated internationally over centuries, establish cooperation in the development of better technologies to improve the quality and variety to benefit from what has been done in the Afro-Asian Region. I am particularly happy that the initiative to develop and transform these technologies has now been taken up by the traditional food industry itself jointly with the Association of Food Scientists and Technologists - Bangalore Chapter. I congratulate both, Messers K.C. Das Private Limited, pioneers of traditional confectionary and AFSTI for their efforts to place this industry on a sound foundation.

Application of the sciences of microbiology and chemistry in particular and consequent upgradation of the technologies will ensure safety, nutritional quality and consumer protection through measures to adapt and develop the existing machinery and also appropriate new machinery and equipment that will go a long way in raising the quality and economics of these products. This is the most urgent need of the day to gain greater consumer confidence and meet the rising transnational competition.

With rising awareness to eliminate kitchen drudgery for emancipating women and the need for ready-to-eat and ready-to-cook food, traditional foods have assumed much greater importance today than ever before in our history. The social change taking place with urbanization and greater demand on women's time calls for speeding up the process of integrated modernization.

It is estimated that within the next 10-15 years nearly 50% of our people will be living in cities and the altered needs of the families will require greater attention of women to many more activities of social and economic importance than just looking after the kitchen. To talk of the liberation of women without elimination of their drudgery is hardly possible. Besides, creation of convenience foods will make it possible to involve the male family members also in sharing the working responsibilities in the home and in saving of time.

Development of integrated modern and traditional technologies to manufacture high quality indigenous foods will also save a great deal of energy of which the country is in very short supply and will have even more of a deficit in the future. In cooking at home, it is estimated that the energy loss can be as high as 80-90% which India can ill afford. Besides, with apartment living, which is becoming quite common in cities to save on building space, the size of kitchens are becoming smaller and smaller which has added to the discomfort of the housewife. Also, cooking at home and washing of utensils requires a fairly large amount of water at a time when its per capita availability is dropping every day. The cost of sewage disposal and garbage removal has also risen quite high and the disposal systems do not have the capacity to deal with pressure on them leading to congestion. In most cities 25-50% of the garbage is not even cleared and this has become a danger to public health.

If food is commercially prepared and processed the waste, which is often 25-40% can be economically utilized especially to make animal feed, of which there is acute shortage. Today the competition for land and water resources between humans and animals is rising rapidly and per capita land availability is also dropping fast and this competition will continue to increase. We are moving towards a situation when by AD 2025 our population is expected to reach 1750 million. In meeting this challenge and generating employment for the rising population, the food conservation, processing and by-products industry will have a much more important role to play. We will increasingly have to depend for animal feed on agricultural residues and agro-industrial waste. Infact it may perhaps become the only future source of feed.

Processed traditional food accounts for 30-50 times the total quantity of preserved food on the market as compared to all the western style processed food, and is the people's real choice and their demand is rising rapidly with the changing style of living. This industry has to keep pace with future needs and improve its standards of quality, safety and hygiene.

With the social transformation taking place, the traditional foods have already contributed a great deal to national integration. Today, for example, the fast food of India, all over the country and even abroad, include dosai, idly, vadai of the South and pakora, cheela, missi-roti and tandoori food of the North. Confectionary like rosogolla, sandesh, chamcham and mishti-doi of Bengal and gulab-jamun, barfi and jalebi have become the preferred choice for all family occasions every where. Food of indigenous origin had contributed more to sustainable national integration than any other item, but this is yet to be realized by our policy makers and the "brown Englishmen" who rule us now. A time has come when we need much more of a conscious and deliberate effort to develop a national food culture and this calls for better, sounder and more economical technologies to raise their shelf-life to increase marketing radius and also exports. Even the street vendors want semi-processed foods like potato flour, dried onions and other ingredients to make their chop (tikia), uttapam and fast food which save them energy, time and working space.

Indian traditional food have made deep inroads into countries of Europe, America and Africa and this can be increased several times by providing traditional food for the micro-wave culture. As an example one may point out that the 8500 Indian restaurants and take-home food counters in the U.K. are doing a booming business. To meet their needs in this age of micro-wave cooking, a time has come to make traditional frozen and semi-processed food so that they can be warmed up or cooked in minutes to serve them hot to the customer across the counter or on the table. Already some progress has been made in this direction at the industry's own initiative but it needs much more scientific and technological efforts to widen the product range and its marketing.

Food processing already ranks as the fifth largest industry in the country. It employs 19% of the total work force and accounts for 14% of the total industrial output. It accounts for 5.5% of the industrial investment and contributes

18% to the GDP. Its contribution to generation of employment per rupee invested is among the largest (Table 1). Turnover of this industry is US $ 36.1 billion (Rs. 14259.5 crores) of which $ 27.8 billion (Rs. 1098 crores) is in the unorganized sector which mainly includes traditional food (Table 2). With modernization of the manufacture of traditional food there can be a real revolution in this industry. The growth rate of various sub-sectors of food processing industries is given in Table 3 and with the rising demand due to increase in middle class incomes and urbanization it will accelerate. We cannot afford to trail behind the demand. Infact development of "new" traditional foods must receive special attention as Messers K.C. Das have proved. Therefore every effort is needed not only to keep pace with rising and changing needs but to keep ahead of it scientifically, technologically, socially and economically. In many cases new and non-conventional raw materials need to be developed, especially raw materials grown on dry land, to reduce cost and raise nutritional quality. Even fortification of these foods with micro-nutrients would be highly desirable to overcome deficiency diseases like goitre and night blindness. Much work is needed on retention of these nutrients, whether naturally present or added during processing and in storage in order to derive maximum benefits from their presence.

I am glad that awareness of the need for modernization of traditional foods in every respect is rising among the food industrialists and pioneers like Messers K.C. Das Private Limited, (supported by professional food technologists), a household name in milk based and other confectionary products, have taken the initiative to organize this Symposium on the occasion of the 25th Anniversary of their successful business in Bangalore. I understand the real visionary behind this effort is Mr. B.N. Das who has already set up an up-to-date laboratory for product development and quality control. His efforts for close cooperation between the industry and the premier body of professional food technologists is a vital step towards accelerating the pace of imaginative development of processed traditional foods and to contribute to development of a nationally integrated food culture.

With the rising awareness to develop high quality processed food, the first and most important need is for cultivating better quality raw materials and for producing high quality milk, poultry and meat to manufacture quality processed products. For this purpose, the industry can finance the farmer jointly with agricultural banks to produce high yielding and better quality raw materials, prevent post-harvest losses which are huge and the prevention of which can add 20-30% food supplies of the country without additional stress on natural resources like land and water.
India's arable land is not rising per capita but it is reducing due to salination, deforestation, floods and exhaustion of organic matter because of deforestation and, indiscriminate use of chemical fertilizers. Improper use of pesticides are playing havoc in many areas. We represent 25% of the world population but have only 4% of the world's fresh water supply. The positive impact of better integration between the pre-and-post-harvest systems and particularly with the food processing industry, can become a major hope for feeding the rising millions and meeting our future challenges of survival and progress, until we achieve better control on population growth. There is much greater need for realization on the part of policy makers that food conservation and processing industry are a key factor in feeding the people and protecting the health and productivity of the nation.
I thank you for giving me the opportunity to be with you today to share with you my concerns, hope and expectations.
I wish the Symposium and its organizers all success.

Table - 1

Food Processing Industry of India

- Ranks Fifth in size in the country;
- Employs 1.6 million workers (19% of total work force);
- Accounts for 14% of total industrial output;
- Accounts Only 5.5% of total industrial investment;
- Contributes 18% to the GDP;
- Turnover of this Industry is US$ 36.1 billion, of **which US$ 27.8 billion in the unorganised sector;**

Table - 2

Indian Food Business in Unorganised Sector

Products	Unorganised Sector (%)
Savouries	65%
Potato Chips	70%
Bakery Products	70%
Snack Foods	90%
Milk & Milk Products	85%
Products in Rural Areas	70%

Table - 3

Growth Rate of Indian Food Processing Industry

Sector	Growth Rate / yr.
Fruit and Vegetable Industry	21%
Milk and Milk Products	7%
Meat Industry	10%
Poultry Industry	27%
Egg Production	16%
Egg Market Demand	10%
Chocolate Production	10-15%

A NOTE ON BENGALI SWEETS BY SRI. R.N. DAS

Mr. Chairman, Fellow Delegates, Ladies and Gentlemen

I am deeply grateful to you for giving me the rare privilege of presenting this paper on Bengali Sweets at this learned and distinguished gathering.

My aim will be to trace, within the limited time allotted to me, the story of Bengali Sweets, from its beginnings to the present, in a capsule form, as it were. At the outset, I want to say that because of the lack of standard material, I shall base the historical part of my paper almost wholly on authentic literary sources.

The earliest references to Bengali sweets go back to over a thousand years to Sanskrit Puranas, to the Charyapadas and to Prakrit texts, written between the ninth and the thirteenth centuries. In these texts we find many descriptions of the daily life of men and women in the villages and towns in medieval Bengal. These descriptions tell us, among other things, the clothes they wore, the ornaments they used the simple daily food they ate and the elaborate festive fare they enjoyed. And like today, sweets were an essential item to end the meal with. The chief sweets included a variety of pithas or cakes, payesh and kheer prepared with thickened milk, sweetened with sugar or jaggery and kheer.

The word kheer provides me with a link to the Vaishnava Age of Bengal beginning from the middle of the first decade of the 17th century an age which marked a glorious phase in the development of Bengali sweets.

But before I turn to it, I should like to dwell for a moment on a paradox we come across in the Mangal Kavyas or the great religious epic poems, that flowered in the second half of the 16th century. The earliest and the greatest of them, Mukundram's "Chandimangal" (circa 1550) and the others that shortly followed particularly Bejoy Gupta's "Manasha Bhasan" may be cited for the purpose. These contain a veritable compendium of not only vegetarian but also non-vegetarian dishes which characterised the traditional Bengali diet as distinct from that of the other Hindus in the Indo-Gangetic Plain.

But the paradox that I spoke about a moment ago lay in the fact that the Mangal kavyas are almost wholly silent about contemporary sweets except for an incidental mention of kheer in Mukundram's "Chandimangal" I say "incidental mention" is because the reference to the sweet occurs not in its main text but in the invocatory tribute to God Siva in the prologue. In it Mukundram describes how on a winter morning, the season of mellow fruitfulness, Siva ordered Parvati to cook a countless number of vegetarian dishes to his specifications and, to top it all, keep ready no less than ten handis (pots) of kheer as dessert.

The advent of Sri. Chaitannya Dev (1486-1533), the founder of Vaishnavism in Bengal and one of the greatest religious and social reformers in India's history, took place in the age described in the Mangal kavyas.

This is not the place to talk in detail about Sri. Chaitanya's profound and permanent religious and social role. I shall however, mention that his cult of Bhakti, his innovation of community worship, abolition of casteism among his followers and marriage by the simple exchange of garlands gave a new direction to the religious practices and social customs among the Hindus in Bengal and elsewhere.

Inspired by Mahaprabhu Sri. Chaitannya's cult of love for all living beings and bhakti, a good majority of carnivorous Bengali Hindus, turned, for the first time, permanently vegetarian. As a result apart from refinements in the rich heritage of vegeterian dishes, the Vaishnava era saw a flowering of Bengali sweets. Here, again we have to depend for our material on literary evidences such as the great "Charitromala" or biographical literary of Sri. Chaitannya by some of his remarkable poet-devotees. Out of this rich crop of biographies, I shall refer here only to the greatest of them, Krishnadas Kaviraj's "Chaitannya Charitamrita" to quote the principal sweets that Sri. Chaitannya loved to eat in his youth in his birth-place Nabadweep on the Ganga. First there was a rich variety of traditional and new pithas,

some stuffed with Kheer, some others with grated coconut and gur. One new pitha, whose mention should be made was the famous 'Malpoa' Although it does not occur in Chaitannya Charitamrita, it came from Vrindaban via the Vaishnavas and later became a naturalised sweet of Bengal. The other sweets included, baras (Vadai) with plantain and other pastes and Kheer, Chanabara, dugdha kusmanda or sweet made with milk and pumpkin, dugdha laklaki, a delicacy made with milk and bottle gourd, payesh and paramanna or rice boiled in milk and of course, the age-old doi. These apart there was phalahar (literally, fruit eating) a snack prepared by mixing chuda or dried pressed rice, champakala a sweet smelling variety of Bengal banana and doi and a seasonal delicacy, ripe mango juice in milk.

I have till now advisedly reserved the mention of the advent of sondesh, made by processing chhana or casein prepared by curdling milk with lemon juice or acetic acid, an epochal departure by the Bengal moiras or sweet makers.

It is to be noted that this method of making chhana by curdling milk was never done by the haluikars or professional sweet makers of north-western India. This was because they held that this "disfigurement" of milk by the use of acid was an act of sin So, on account of this taboo, they continued to make a wide variety of sweets with kheer, lentils, atta and flour which form their stock-in-trade till this day.

History does not declare who was the first genius moira or haluikar who devised the process of making the supreme sweet sondesh. In fact, if we knew who it was we will have commenorated him by installing his statue in gold.

This is because the making of sondesh and a wide variety of other Bengali sweets that were one-step away from milk, was a unique contribution of the Bengali sweet makers. As a matter of fact this cannot be said of most sweets in the other countries of the world. For example, such sweets as cream and puddings are made directly from milk, which is also true of the modern ice cream, possibly the most widely consumed sweet in the world.

Over the centuries, the making of sondesh in a number of varieties was improved and refined. It however, reached its present perfection at the hands of that noted sweet making artist, Bhim Nag who opened his shop in Central Calcutta around the sixties of the last century. Today among the many of excellent sondesh makers in Calcutta, and elsewhere, Bhim Nag still remains on top.

Simultaneously with Bhim Nag, another man of genius appeared on the Bengali sweet making scene, Nobin Chandra Das who has been affectionately immortalised as "Nobin Moira" by Bengalis as the inventor of Rossogolla, a king among Indian sweets.

Nobin Chandra was born in a family of sugar barons in Baghbazar in North Calcutta in 1846. By the time he was born, his family's flourishing business of making pure crystalline sugar by refining sugarcane jaggery through a special indigenous technique for sweet maker's was in decline. To add to this trouble, Nobin was a posthumous child whose mother had to face enormous hardship, in bringing him up. Despite Nobin's lack of schooling and his poverty-ridden childhood, his loving and resolute mother helped him in two important ways to pave the way to his furture. First she persuaded him to open a sweet shop as a career. Secondly and more importantly, to get him married to the grand daughter of Bhola Moira, the legendary Kavial or impromptu poet-dueller of the early 19th Century. This alliance helped Nobin in many ways.

When Nobin set up his shop at Baghbazar in 1864 the principal sweets then sold were those made from ground lentils, atta and flour apart, of course from sondesh the favourite of the great compradore Bengali Baboos and other affluent people in gaslit Calcutta. Young Nobin was quick to sense that a growing section of the rich, not satisfied only with sondesh were looking for an equally good new sweet to please them. Accordingly right from the beginning of his career, Nobin, needles to say, was not in the least content to engage himself in the role of a vendor pushing sweets to customers across the shop counter. On the contrary, living at a time of full tide in the great 19th century renaissance in the field of knowledge and culture, Nobin Chandra had imbibed the spirit of enquiry and enterprise that inspired and guided this great historical movement.

Accordingly, Nobin Chandra began to spend hours every day to invent a sweet that would match sondesh in goodness and taste. Finally, after four long years, his struggle and experiments were crowned with success. One fateful morning in 1868, he succeeded in making the soft, snow-white round fluffy balls, swimming in a bowl of transparent syrup to which he gave the inspired name, Rossogolla. Then over years of marketing effort, Rossogolla, the parvenu, earned the same status as the patrician sondesh. As a matter of fact, thanks mainly to the excellence of Sondesh and Rossogolla, Bengali Sweets have won international recognition. For instance the latest English edition (1996) Larousse Gastronomique, the Bible among the books on world culinary art, in its entry on Indian and Pakistani foods, has made a special mention of the excellence and variety of Bengali fish dishes and sweets.

I now mention some of the other chhana based Bengali sweets. Two of them are fried products like Pantua and Ladykeni (named after the vicerine Lady Canning for whom it was specially devised). My story will, however remain incomplete if I do not make a mention of the many rich regional sweets famous for a century or more. Some of them, for example, are Monohara of Janai, Sitabhog and Mihidana of Barddhaman, Langcha of Shaktigarh, Sarbhaja and Sorpuria of Krishnanagar and the Doi of Mollar Chawk, a worthy companion to Calcutta's Mishti Doi, now favourite all over India.

I dare say that I would not be accused of conceit if I say that by the virtue of goodness, taste and popularity, Rossogolla may rightfully claim the status of the national sweet.

As a member of the proud body of the Bengali sweet makers and the House of K.C. Das I assure my distinguished guests that we shall ceaselessly continue to maintain, improve and devise new products, just as my grand father K.C. Das (Nobin Chandra's son) and my father, the late Sarada Charan Das who had, among others, had devised the now-famous Rossomalai or Rossogollas, floating in cream, which has become a perennial favourite and which even the snooty sahibs served as a dessert in Raj dinners.

All this was fine but instead of complacency, success has always served as a spur to our progress. For instance, apart from Rossomalai, Krishna Chandra also canned Rossogollas to make them nationally available.

But more sweeping innovations from production to marketing were made by my father, Sarada Charan Das (1906-1992), Krishna Chandra's youngest son. He first laid the basis for a purposeful expansion by turning the company into a Private Limited one, K.C. Das (P) Limited, in 1946. He also pioneered the mass production of quality sweets by installing equipment of his own design. He expanded marketing by opening outlets all over Calcutta and more significantly by establishing a factory and a shop in Bangalore in 1972. His product innovations included new varieties of Sondesh for diabetics and a new Sondesh named Amrita Kumbha, a complete departure from its conventional Sondesh in shape and taste. Finally, I should like to extend full credit to my youngest brother, Birendra Nath to conduct our operations in South India from Bangalore for over the past twenty-five years and keep our flag flying with infinite ability, devotion and dedication.

Today, as the head of K.C. Das private Limited, we have been trying our best to carry on the tradition that we have inherited from our predecessors and have already introduced several new varieties of sweets and snacks.

A final word and I end. As we all know, mankind's first source of sweet was natural honey or modhu as mentioned in our Devabhasa, Sanskrit. Since the Vedic times, the word modhu stands as a great symbol of holiness and all that is blessed, joyous and sweet in human life.

Though we know our limitations we always keep this lofty ideal to inspire us to make sweets that will bring an element of joy in our lives.

4th April, 1998

FOOD AND NUTRITION TRENDS IN INDIA : OPPORTUNITIES FOR FOOD FORTIFICATION AND COMMERCIALISATION OF TRADITIONAL FOODS

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(Key Note Address delivered at the Symposium organised by AFST (I) India, Bangalore Chapter on April 4th '98 on "Integration of Modern and Traditional Technologies in the manufacture of High Quality Indigenous Processed Foods".

At the outset I would like to thank Shri B.N. Das, Professor P.A. Shankar and Dr. H.A.B. Parpia, for inviting me to give the Key Note Address at this important Symposium on "Integration of Modern and Traditional Technologies in the Manufacture of High Quality Indigenous processed Foods". Dr. Kalyan Bagchi, a Nutrition consultant like myself, was to have given this address. Unfortunately he was unable to do so. It was indeed kind of him and Dr. Indira Charavarthy, Director, Micronutrient Initiative, Asia, to have suggested my name. This is the reason I'm here with you this afternoon. I am also very happy to be back at the IIsc., where I did my MSc in Bio-chemistry, decades ago!

I propose to divide my 30 minutes talk into 5 parts as under :

1.Some food and nutrition trends in our country.

2.Opportunities for Micronutrient Fortification of mass foods of consumption.

,3.A Systems Approach for the Integration of Traditional and Modern Technologies.

4.Some Traditional Foods and Technologies that have been commercially upscaled.

5.Public - Private Sector collaborations to eliminate malnutrition.

As I am a nutrionist like Dr. Bagchi, I hope I will be forgiven if I first redefine Traditonal Foods (TFs) to mean "A traditional Indian diet". A typical Indian diet is very high in cereals and low to very low in expensive items such as milk, pulses, oils, vegetables and fruits. As pointed out by Prakash (1a), Food, Nutrition and Health need to interface. This is not happening at the present time.

I. POPULATION, FOOD INTAKE AND NUTRITIONAL DEFICIENCY TRENDS

(2) FOOD PRODUCTION :

FOOD GRAINS : The Green Revolution has boosted the production for wheat and rice tremendously. But we need to reach 250 MT annually to ensure food security. Production of coarse grains (millets) which the poor eat has gone up minimally. Increase in pulse production has been poor. Since "cereals and pulses" form the bulk of most Indian diets and provide most of the food energy and most of the other nutrients, it makes good sense to enrich or fortify these two bulk consumption commodities.

SUGARCANE AND OIL SEEDS : Both sugarcane and oilseed production have increased remarkably. But the high price of both these commodities have had a negative impact even on the Middle Income Group (MIG).

VEGETABLE / MILK / EGGS / : Vegetables, milk and egg production have also gone up since 1971. But so has our population ! Our Agricultural production is hard put to keep pace with our explosive population growth. One billion of us in 2000 AD & 2 billion in 2050 ! Preservation of crops at the site of harvesting (irradiation technologies) and further processing for extended shelf-life have become imperative. This particularly needs to be done for potatoes and onions. Likewise fluid milk, milk products and powdered, skim, or whole milk lend themselves to a variety of micronutrient fortifications. There are great opportunities for fortification / enrichment of most of our common food stuffs at a very modest cost of 0.5 to 2% of the food commodity (3)

NUTRIENT AND NUTRITIONAL DEFICIENCIES : Forty percent of all Indians are likely to be living in urban conglomerates by 2000 A.D. The slum dweller is the worst affected. The greatest nutrient deficits are with respect to Vitamin A, Vitamin C and riboflavin. Although dietary intake of iron appears to be adequate, in actual fact it is not so due to the inhibitors (phytates) in our cereal-based diet. We are probably the most anaemic nation in the world. IDA depresses physical work capacity and certain areas of cognition.

POPULATION AT RISK AND AFFECTED BY MICRONUTRIENT MALNUTRITION : Vitamin A, Iron and Iodine are the three major micronutrients that have attracted a great deal of attention in the past decade. South Asia has the dubious distinction of being the most affected. Hence, fortification of common food stuffs is the need of the hour(4).

OPPORTUNITIES FOR FOOD FORTIFICATION : A very wide range of food stuffs in the broad categories of milk, flours, snack foods, oils/hydrogenated fats, juices, sugar, powder beverages, leaf tea and salt to name some of the commonly fortified foods world wide. Fats and oils are traditionally fortified with Vitamin A, D and E. In India, it is the palmolein that is distributed in the PDS, that urgently needs to be fortified with red-palm-oil concentrate. The cereal flours and milk powder can take the whole range. Salt can take triple Iron + Calcium + Iodine.

Food fortification has to a large extent been responsible for the disappearance of vitamin and mineral deficiencies in the developed world.

STABILITY TEST OF VITAMIN A FORTIFICANTS IN TEA DUST AND LEAVES : Since India is predominantly a tea drinking country where even young children drink it, it would be eminently useful to fortify (i) The dust (the poor man's tea) with Vitamin A palmitate + all the other possible vitamins + minerals (ii) Tea sachets can be fortified with an entire "Vitamin + Mineral premix (iii) Tea leaves with Vitamin A palmitate or acetate.

FORTIFIED COMPLEMENTARY FOODS FOR THE INFANT : There is a recent trend in may developing countries to set up low investment, labour, intensive, semi-industrial scale projects for manufacturing weaning foods. This multi-mix generally consists of the staple cereal (80%); pulses (10%) and oilseeds (10%). Vitamins and minerals are added at the last stage. India has 10 Ready-To-Eat (RTE) weaning food plants doing very much the same thing but using the extrusion process. I had suggested to WEP in 1994, that commercial barley malt (germinated and sun-dried barley grain powder) be added at the cost of the cereal, at the final blending-in-stage or when the vitamin-mineral premix was added. My suggestion was based on out 20 years of laboratory and community-based-research on our Amylase-Rich-Food (ARF) technology. This had won us a WHO-Collaborating centre for Weaning Technology at M.S. University, Baroda. Our concept was based on the fact that any germinated, dried cereal powder is a veritable store house of Alpha Amylase. This easily breaks down the carbohydrates (cereals) on cooking with some water. The resultant is a smooth nutrient-dense semi-liquid slurry which our repeated trials have shown to result in much, much greater intakes per sitting by the weaning-age child, and therefore, significantly improved growth velocity of these children (5).

A CEREAL FULLY FORTIFIED WITH A VITAMIN-MINERAL PREMIX FOR REFUGEES : This has already been formulated for African refugees. The formulation can be greatly improved by the inclusion of 5% barley malt powder as most of the refugees, especially young children, pregnant women and the elderly need nutrient-dense but semi-liquid feeds.

III. A SYSTEMS APPROACH FOR THE INTEGRATION OF TRADITIONAL AND MODERN TECHNOLOGIES

Prakash (Ia) has suggested that an integrated approach should be adopted to cover the entire system of production, packaging, transportation, storage and marketing of the traditional foods. I could not agree more. I would only add "procurement of the raw materials and the necessary market research" before production. Nutritional evaluation and Food safety will have to follow once the product is in the market place. I think the time has come when not only academia, research institutions and industry should come together but the composition of the team should have the necessary experience and expertise.

Five regional workshops on Regional Foods have been held. A tremendous amount of information on Indian TFs has been gathered. Parpia (Ib) states that TFs constitute 30-50 times more than all those of the western style processed foods put together. The National Informatics Centre, Hyderabad has generated an enormous Indian foods data-base

for the various regions of India under various culinary categories. This is certainly a good starting point for any manufacturer who would like to commercialise a TF. But I feel much more operational research is required on how to improve the quality apperance, shelf life, packging, advertising etc., of these TF's as much research is required to see how the small manufacturers can enrich or fortify their products by either using fortified raw ingredients (flour, oil etc) or alternatively by adding specified amounts of a vitamin-mineral premix at an appropriate juncture of production. Somewhere, in this integrated systems approach chain, we must also put our heads together and devise hygienic and affordable cooling-boxes or chambers where the perishable TF's can be stored.

IV SOME EXAMPLES OF TRADITIONAL FOODS THAT HAVE BEEN COMMERCIALLY UPSCALED (5, 6)

1. ROSSOGOLLA : It is but fitting that we start with this delicious spongy all - India favourite which was introduced by Nobin Chandra. Commercial canning commenced in 1930. Continuous cookers have been devised by IIT, Kanpur for Rossogolla and Sandesh.

2. TRADITIONAL READY-TO-EAT SNACK FOODS : All the snack variety (murukus, boondi, fried peas/peanuts etc and sweetmeats) were extremely popular. The national Institute of Tropical Diseases actually showed that TF's were more safe than Ice-cream or Bakery products.

3. PICKLES : This TF accounts for a huge 800 crores in the organized sector itself. The non-organized sector is even larger. The need of the hour is to design suitable equipment for the peeling/slicing operations. Pickles are a big export earner also. The PFA rules are antiquated and have to be changed. CFTRI has standardised the process of making instant pickles from mango and lime.

4. PAPADS : This dry ready-to-fry or roasted item is immensely popular in all parts of the world. Papads are made right from the cottage to the corporate sector.

5. INSTANT DRY MIXES : The organized market for Instant mixes for dosai, idili, bise-beli-huli-anna, pesarateu, kulfi, badam kheer rabri etc., is very large. These TFs are an immense boon to the busy housewife. The drudgery is taken out of the cooking.

V. PUBLIC-PRIVATE SECTOR COLLOBORATIONS TO ELIMINATE MALNUTRITION

A recent meeting was held in Ottawa in end 1995 on sharing Risk and Reward where representatives of the Public Sectors, International Agencies, Food Technologists, and Private Sector food companies got together to address the problem of global malnutrition and to see how it could be resolved. The World's population is 6 billion, 2 billion suffer from reduced physical and mental performance; 500 million manifest clear clinical signs of under and malnutrition. Fortifying foods of mass consumption with vitamins-minerals at just 0.5 to 2 % of the total cost of the commodity emerged as a front runner (3) In India TFs could be considered as part and parcel of our traditional diet. Hence, we should seriously consider fortifying them with vitamins and minerals as well.

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PRESIDENT'S REMARKS

India is a country of many diverse cultures, agroclimatic regions, 17 major languages written in 9 scripts, hundreds of minor languages and thousands of dialects. All these cultures have their own rich culinary arts that have evolved over centuries to feed the people nutritionally with many delicacies that are being increasingly appreciated nationally and even globally. Several foods have been developed to meet special purposes such as the needs of children, pregnant and lactating mothers, post-natal diets, gereatric foods for the elderly and ceremonial foods for special occasions.

A combination of the cuisines of nearly 40 cultures, with modifications where necessary, can provide the richest and the most delicious diets ever known in the world. Most of these diets originally emerged from the home kitchens and remained circumscribed to limited areas or to small communities. As time went on there was development of trade between different parts of the country and this brought about cultural, social and culinary interaction between societies. Thus the food preparations also moved from one culture to another. In the process they got enriched mutually. This was perhaps the first major step in integration of foods of several areas with each other although the progress was quite slow due to certain traditional and sensory barriers. What accelerated the process of building inter-cultural relationship was the colonization of the country. The colonialists broke many cultural barriers. The development of faster means of communication, particularly the construction of roads and laying of railways which transported people to distant places to live together. The process was further accelerated by industrialization combined with urbanization. This brought people of all indigenous and even some foreign cultures to the cities and made different people live and work together for better living. It made them understand and even appreciate each other's cultures, art and particularly food preparations. Creation of common understanding also led to standing up for common causes and particularly to the creation of a unified freedom movement for independence, which helped to convert different nationalities into a nation.

The industrial culture stimulated especially the production of processed foods as a business. A variety of multi-cultural restaurants and confectioners came into existance and they began to upgrade and improve their products professionally to meet the changing and diversifying consumer demand. Thus the food business moved from the household and the neighbourhood to much larger commercial kitchens. At this point the preparation of foods went up quantitatively in scale and in variety but there was very little change in the traditional preparation techniques and the type of equipment used by this business. Its further growth to meet the rising demand called for change in preparation and processing methods as necessity. This also called for changes in quality standards of the raw material to ensure uniformity of the finished products and longer shelf-life for marketing. Also awareness grew for food safety, uniformity and attractiveness which necessitated greater efficiency in production through use of radically different and superior technologies and consequently change over of the equipment that went with it. We are still at this stage and further progress through development research as joint effort of the traditional food processing industry with research institutions.

A major breakthrough is demanded by the need for longer shelf-life to transport processed, preserved and better packaged foods from one place to another across long distances and to retain and improve the acceptability of the food across the cultures. Production, handling and transport of raw material in larger quantity without detroriation on which depends of quality of the finished processed products, has raised the necessity for the application of the combined knowledge of the science of microbiology, chemistry and physics to achieve the goal of using better and

more economical technologies in the interest of the manufacturer and the consumer. This has also made it imperative to use better process control systems to ensure the desired levels of moisture, temperature, time, osmotic pressure etc., for regulating them at optimal levels. The techno-economic transformation in this direction has begun, thanks to a few enlightened enterpreneurs but needs to be speeded up in the interest of the survival and progress of the Traditional and integrated food industry of the future. It calls for systematic changes at each step from cultivation of the most suitable varieties of raw materials, their harvesting at optimal maturity, and in case of milk and dairy products proper animal breeding, feeding, rearing, milking and handling, transport, storage, use of low refrigerated storage as well as use of better and newer product preparation methods for processing and packaging as well as for marketing to meet the consumer needs of today and the future. The demand for better quality, greater safety and improved appearance is rising. People eat for taste but also for the attractiveness. Thus the tradition of food preparation has to be converted into inter-disciplinary technologies based on Science in order to build modernized traditional food industry of tomorrow that would serve the people's rapidly changing needs. The scope for these foods is unlimited and they are contributing to much faster inter-cultural development of the country. In this respect food has much more to offer than perhaps any other factor to building of the nation and its health.

A time has now come when it must be recognised that Food Science and Technology must play a much greater role in speeding up the social, economic and technological transformation through traditional processed foods to eliminate kitchen drudgery, and to the emancipation of women in particular so that they can contribute their time and effort more effectively to building a better quality of life. This new multi-dimensional role of the truly indegenous food technologists is assuming greater importance every day. We must keep abreast and even ahead of the needs of that 50% of our population who will be living within the next 10 years in cities. The rising middle class, consisting of atleast 100-150 million people, is already demanding more of the ready-to-eat and ready-to-cook processed and semi-processed foods of their choice and tradition. These foods are loved not only by people of India but are fast becoming popular worldwide.

The best way to raise the nutritional standards, especially of the low income people, is to protect the natural nutrients present in their foods through their better production and processing but supplements of certain micro-nutrients may also be added, where necessary, to overcome dietry deficiencies. For this purpose the traditional foods can perhaps become the best carriers. Processing technologies must however be designed to ensure that these additives are retained optimally. This will need more research on improvement of process control.

Food industry as whole already accounts for employing 19% of our labour force and occupies 5th position in our industrial turnover. Over 60% of it is in the unorganized, tiny and small industry sector which is the backbone of employment and poverty reduction. We must increase its efficiency and improve performance to produce safer, more attractive and nutritious foods. This can best be done by a socially enlightened approach and more purposeful application of natural sciences to re-build our traditional techniques into modern technologies for the manufacture of more up-to-date machinary and equipment in order to place this industry on a new dynamic foundation. This will raise its competitiveness within India for global business. It was with this objective and vision of the future that the programme of the Symposium on "Integration of Modern and Traditional Technologies in the Manufacture of High Quality Indigenous Processed Foods" was formulated. We hope the recommendations made by the participants will help this industry to march forward with greater vigour.

First Technical Session

INNOVATIONS IN PROCESSING TECHNOLOGY

Chairperson: Dr. K.T. ACHAYA

Speakers:

1.Innovative Matrix in Technology Management by Dr. V. PRAKASH

2.Technological Aspects of Innovative processing by Dr. B.N. MATHUR

Concluding Remarks by Chairman

*FIRST SESSION : **Dr. K.T. Achaya** : Chairman for the first session:*

Friends, we are at the start of the technical sessions and this first one is "Innovations in Processing Technologies" We have two very very eminent professional speakers indeed and I don't propose to smudge their time or their handiwork with a lot of hindering remarks at the start. But I thought I would say that so much is now involved in the historical development of the Indian food and concepts etc. That I would make a brief remark, to show that innovation has not exactly started yesterday, it has been happening right from the start of the traditional food. Industries from the centuries had not too many means of gathering into them or knowing their origins or pinpointing where what happened or did not happen. Take an example like Idli ; we know it was first mentioned in 1920 AD kannadalasa but it is mentioned as a pure dal product and fermentation is not mentioned at all. Somewhere along the line the introduction of the rice component, the mixed fermentation the steaming all came about but it is impossible to pin point when these things happend. So hitherto there are many unsung heroes in the traditional technologies. We will just have to bow our heads to them without being able to document them. But there have been technologies from also the centuries in other areas we know, mythologies, the marvels of Indian iron and steel, of ores of zinc and copper and so on. A beautiful volume issued by Indian National Science Academy a month ago with about 30 chapters, History of Technology (vol.-I) on diverse aspects of typical Indian technologies come to the colonial period and come to the definition of a positive frame of mind. One of the great inventions within India was the CTC process of weathering of the tea leaf. It was totally an Indian development and production of Rum from molasses was an Indian development with worldwide ramification where ever sugar was grown. First white crystal sugar grown in India made from gur and from khansa required a good deal of technological inventions which was there and lot of other examples which is not very relevant. Since Independence, of course everything got it's fair price, and it is fair to say that many of the inventions were in the dairy to, thanks the superb work at NDDB and NDRI. We had technology for gee, khoa, for shrikand, misti doi, Rossogolla by K.C. DAS, which was, mentioned this morning and several other milk sweets.

It is also fair to say that CFTRI pioneered cereal based sweet, especially instant mixed and protein based products. Many perhaps did not continue to survive, but the fact remained that there were innovations at CFTRI Mysore that spread into the industry. The DFRL has played a significant role with moisture foods and removal of water from the chappaties and packaging of the chappaties etc. I think we shall have a detailed talk on it later. The future scope is enormous because there is wealth of food products waiting to be technologically upgraded and commercialised, to share the keynote address, which has enormous possibilities of nutritional fortification which is very very badly needed in the country. There is no doubt about it and there are possibilities of doing so very simply today for so many foods like the example of milk. We have to work on technological sessions which take into the account the microbiological, chemical, biological and emerging aspects before we can hope for satisfactory solutions. We may not truly innovate the striking breakthrough of innovative nature but there is enough scope of a great deal of adaptation and the innovations that will also come because it will prepare the mind in the course of indigenisation. I don't want to say any more as we have two very very respective speakers with profound knowledge and experience.

Conclusions:

Thank you Dr. Prakash and Dr. Mathur,

I think I wont say much except that we have listened to two splendid talks. I think Dr. Prakash was poetic and philosophical. It was a very complex and well thought talk.

Dr. Mathur on the other hand was practical, specific analytical problems, gave us examples of gee making, khoa, shrikand and so on.

All together, we benefited to grom listeing these two splendid speakers. I thank the organizers who have asked me to preside over this first session.

INNOVATION MATRIX IN TECHNOLOGY MANAGEMENT

V. PRAKASH Director. Central Food Technological Research Institute, Mysore - 570 013

It is a unique function of 25 years of M/s. K.C. DAS (P) Ltd., In fact, they K.C. DAS (P) Ltd., started with Rosogolla but it would not be wrong if I say "K.C. DAS today means Rosogolla". Therefore, it is a marvellous day for us to really congratulate them on this very well done job for the last 25 years and we wish them a much productive and innovative next 25 years. We wish and I am sure some of us, will be around to see the golden jubilee of M/s. K.C. DAS (P) Ltd., here.

M/s. K.C. DAS (P) Ltd., are very close to all of us for two reasons. They are the innovators, especially Mr. Das and they try to translate innovative ideas into practical knowhow. On the second side, they take that high risk in marketing, forseeing the market and convert book knowledge in selling techniques into practical knowledge. We are wholly aware as a consumer, the high risk in marketing, forseeing the market and converting book knowledge into practical knowledge. In fact, in both of these aspects they have done marvellously well and my congratulations to them.

The second aspect is that the AFST(I), Bangalore chapter has taken a very good lead in organising this half a day symposium, with the integration of modern tradition and technologies as well as techniques in the manufacture of high quality indigenous processed foods. As Mr. Das has rightly mentioned, it is very vital for us to really address ourselves on these issues. Whenever we say traditional food, the safety aspects need to be also mentioned. As I mentioned to Mr. Shankar today, what we need here is a matrix in technology management both for small scale and medium scale industries. This is happening in AFST (I), Bangalore, as the whole session is converted into an innovative matrix.

When we look at innovative matrix in technology management, the word management is a basic word. To address such a topic in the limitation of 20 minutes will even make everybody very innovative as even giving such a talk briefly, it probably takes more than 30 minutes. Any industrial venture can only happen with the cooperation of people, who generated technology with entrepreneur, financial bodies, infrastructure availability, the policy support and the adaptable nature of the technology. I wish to elaborate from A to Z, but will restrict myself to the technology part, entrepreneurship and partnership between R & D institution and the industry.

In any developing country, the economic growth is normally related initially to the small scale industry (SSI) and these units therefore have a tremendous push and pull effect on the economy. It also has another aspect, i.e., employment potential. Even in these cases also, the innovation matrix and the entrepreneurship aspect are the driving forces in the technology management system.

The industry - R &D institute partnership can be the driving force for innovativeness in a technology system. My talk on innovative matrix, entrepreneurship and partnership will be confined to few cases. In any partnership with R&D institutions, the industry is the major receiver at the end of the game and that too with little financial inputs. There are a number of different and distinct types of parnerships and I do not wish to go in details to these aspects. There are also many theoretical and practical definitions. What is more important to industry is to use the resources available with, say, another organisation under agreed terms and conditions for gaining advantages. For any partnership to be successful, there must be confidence among the partners., while to effect the partnership one must have a will to do so. These are very vital aspects at any given time. Similarly, to be an entrepreneur, one must have self-confidence which incidently gets developed easily in the family business because of the environment and practices in family business / homes. Push and pull type of Self - confidence can lead to ultimate success in any enterprise. One should have a mind set and confidence to survive right from the beginning to the end.

A number of factors are involved in becoming a successful entrepreneur. One of the most important factor is the ability to take risk and there is no success unless risks are taken. There are no well defined strategies in the books or information on the financial aspects and methodologies to become a successful entrepreneur. One has to do the activity in right direction, in addition to study trade behaviour and develop ability for facing crisis. If the customers are not satisfied and start criticizing, one has to immediately respond and work for alternatives to satisfy the customer. In this regard the entrepreneur has no choice and has to act swiftly.

The entrepreneur, thus, has to be action - oriented and highly motivated individuals for being able to take risks to achieve the goals. The behavior traits of the entrepreneurs thus include self confidence, task and result orientation, risk acceptance, leadership, originality and future orientation. All these become a trade - mark of the entrepreneur. Entrepreneurship, a culture which anyone can develop, is beyond the realm of IPR and patents. Our youngsters, who have these traits, must act swiftly before somebody else takes up the issue.

Let us now turn to innovative matrix in technology management. A successful industrialist always tries to integrate technology innovation into entrepreneurship and partnership with R&D institution. India is a very different country. The data available show that our consumer is a very sensitive person, however uneducated or unskilled he might be. However, our consumer is largely a traditional person also and we cannot easily induce him to buy low quality product dumped in the market at lowest cost, because he is also very conscious of the quality. This is one fundamental point and the entrepreneur has to be really innovative in adopting effective methods to survive in such marketing strategies by the rivals.

Thus I would like to focus on the word "innovation" as the key point of the talk and I am sure those successful scientists, engineers, technologists entrepreneur are all a class who have become successful by innovative approach.

INDIGENOUS DAIRY PRODUCTS : TECHNOLOGICAL ASPECTS

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INTRODUCTION

Milk and milk products occupied a place of prominence in the dietary regimen, as well as the ceremonial aspects of the social and religious customs among the Ancient Indians. Historical records of the pre-Aryan Negroid civilisations depict ingenuity to extend usage and conserve perishable milk nutrients. Considerable significance was attached to the relationship between the type of food consumed to promote divine virtues of mind. Milk, honey, and grains (vegetarian food) were considered to promote divine virtues of mind and were recommended for scholars and sages in pursuit of religion (Chamd, Up. VII: 9.1). Boiled milk, butter and ghee were ascribed unique nutritional and tonic virtues (Rv. X. 29.6). coagulated milk products prepared by mixing sour milk with bark of palasa tree (Tait. Sam II, 5, 3, 5). Milk rice was the favoured food of early Buddhists and Jains (Yuan Chang).

CLASSIFICATION OF INDIGENOUS MILK PRODUCTS:

A wide range of indigenous milk products some of which have region specific connotations as well as those others that have a national complexion may be classified on the basis of the process employed for their manufacture.

- Heat Desiccated Products :

- Khoa based : Burfi, Kalakand, Peda, Gulabjamun

- Basundhi, Rabri, Khurchan, Kulfi.

- Heat/ Acid Coagulated Products:

-Chhana Based : Rosogolla, Chhana murki, Sondesh, Pantua, Chumchum, Ras malai, Ksheer Sagar.

- Paneer, Chhurpi, Surti Paneer.

- Fat Rich Products :

- Makkhan, Ghee, Malai.

- Fermented Milk Products :

- Dahi, Lassi, Chhas, Shrikhand, Shrikhand Wadi, Mishti Doi

- Milk / Cereral Based Products :

- Kheer, Phirni, Pal Pysum., Dudh Pak, Kheer Mohan, Khadi.

Due to the absence of specific statistical information, it is not possible to give the exact figures for the utilisation of milk for the production of indigenous milk products: However, on the basis of certain assumptions, following projections have been made :

Table 1: Production of Indigenous milk products (utilisation of total milk production in India : 50-55%)

Product	Tonnes/annum	Value (Rs. million)
Ghee	650000	585500
Lassi	-	10000
Khoa	600000	18000
Paneer	300000	10500
Chhana	100000	3000
Basundhi	25000	50

Source: Aneja, R.P. in Dairy India (1992)

CURRENT STATUS

Strengths : These methods of preparations have evolved over the centuries where due to the availability of small scale handling, operations have been performed using simple equipments/appliances. The technologies for domestic / cottage scale are therefore, already well established. Indigenous products have ready acceptability in view of the long traditions that form the rich cultural heritage of our country. Another favourable feature of the traditional products is that they permit significant value addition in the manufacturing process.

Weaknesses : most of the production of indigenous milk products is confined to the backyard operation and cottage scale levels. Due to this, most of the processes employed are labour and energy intensive leading to highly variable product quality. It has to be recognised that there is lot of special skill and "art" involved in attaining the quality standards for creating a niche market. Presently, the packaging systems are either totally absent or lack the standards which are crucial for organised marketing of national networks. The shelf life of the indigenous milk products is severely limited and so is the safety from the point of view of consumers due to the lack of packaging systems. There are several literatures/reports implicating outbreak of diseases and food poisoning due to the microbial contamination originating from the raw materials employed in the manufacture process or due to the product deterioration during marketing. Marketing of indigenous milk product is essentially limited to the local areas. Considerable R&D efforts are required for meeting the serious challenges in the world for scaling up of these operations suitable for larger handling and organised marketing.

Opportunities : The newly emerging Indian middle class society with its collective purchasing power represents perhaps the largest consumer group in the world. At the same time, there is a growing awareness for hygienically produced and safe food products. Additional prospects exist for export to the ethnic markets abroad. Many of the well established western dairy foods are placed towards the closing end of the short life-cycle, which would give way to newer variety of processed foods of ethnic origin.

Threats: newer technologies constantly face the threat of varying dimension and magnitude. Products produced from the innovative processes may differ considerably from their respective traditional form and may not be totally acceptable to the discerning consumers. The cost of such failures may be too high. Half hearted R&D and marketing promotion may not yield anticipated profits.

TECHNOLOGICAL REQUIREMENTS :

Due to the growth awareness for the safety of milk and milk products in relation to human health, there have been increasing demands for improving the manufacturing and packaging aspects of traditional milk products for organised production and marketing. Handling of raw milk would have to be consistent with the WTO guidelines for sanitary and phyto-sanitary requirements.

One of the pre-requisites for process of up-gradation is to standardise the product profile in terms of its sensory, physio-chemical, microbiological and nutritional parameters. It would be, therefore, necessary to carry out systematic surveys for establishing these parameters on a scientific basis. The end product obtained by the industrial process would have to meet the criteria of product characteristics defined on scientific basis as well as consumer acceptance studies.

Considerable success has been achieved in Japan for upgradation of the technology for the production of traditional foods by integrating various unit operations involved in the manufacturing process with the newly emerging technologies. In designing newer processes, it would be very desirable that these intermediate unit operations are performed by incorporating principles of labour and energy services. Some of the technologies which have been successfully adopted involve UHT particulate processes, membrane process (micro-filtration, ultra-filtration, reverse-osmosis and nano-filtration) microwave process, aseptic packaging etc.

Another technological requirement for accelerating the process of development is to incorporate the versatality of utilising alternate sources of milk solids for process up-gradation. This would help to overcome imbalances in milk production due to regional and seasonal fluctuations.

One of the most serious limitations in large scale production of traditional milk products is the lack of packaging systems which include both packaging materials as well as machines. The cost of packaging materials is relatively high in India. It is significant that considerable work is being done in the developed countries of the world to evolve edible and environmental friendly packaging materials. The choice of suitable packaging material is indeed critical in relation to the product characteristics. Edible film packaging has been developed using polymers of proteins from both plant and milk sources as well as different kinds of starches. Development of cost effective packaging material that would impart product safety and shelf life to the final product is crucial for accelerating the pace of development.

Likewise, packaging machines that perform high precision operations at a fast pace involve highly specialised precision engineering and calls for innovative designs. Naturally, development of specialised equipments for the wide range of indigenous milk products is an unwise proposition. However, scope exists for modifying the available equipments for packaging of a range of indigenous milk products that have similar kind of product characteristics and rheological / product flow properties. There is a need for collaboration between industry producing packaging materials and machines, R&D Institutions as well as end users to undertake this challenging task to evolve plausible solutions.

Since the risk element of R&D failure for the newly evolved technology is certainly very high, there is a need for intensive financial and scientific inputs for undertaking proposed developmental programmes. The product obtained by the newer technologies need to be evaluated for sensory, physico-chemical, microbiogical and nutritional attributes. For commercial handling, the shelf life test would have to be ensured in order to pave way for marketing on the national network. It is imperative that newer concepts, protocols based on the principles of accelerated shelf-life test design and simulation models be developed through appropriate R&D efforts to predict the shelf-life behaviour. The final product needs to be test marketed in sensitive areas to evaluate the consumer acceptability.

The engineering inputs for scaling up of pilot scale design to the industrial scale requires considerable scientific and

design challenge. It would be useful to establish National Demonstration Centres for the processes of propagating the newer technologies developed. These demonstration centres could also serve the useful purpose of training the personnel from industry to enable the new entrepreneurs to undertake commercial production, as well as testing of new raw materials, packaging materials for continuity in endeavours for up-gradation of process and product quality attributes in a cost effective manner.

RECENT INNOVATIONS IN INDIGENOUS MILK PRODUCT INDUSTRY :

Considerable success has been achieved for the industrial production of ghee, Shrikhand, Gulabjamun, Peda, Burfi and Mishti-Doi in the organised sector of the dairy industry where intermediate unit operations involve in the manufacturing process have been successfully combined with the energy efficient modern equipments.

Continuous Ghee making Process:

A number of industrial processes are in vogue for producing excellent quality of ghee. Initial attempts were made for production of ghee by first seperating cream followed by butter making. By employing pre-stratification process most of the moisture was removed, after which the fat rich fraction was superheated in a suitable heat exchanger or vacuum pan for final heating / development of typical flavour (fig. 1). In a process patented by Punjrath (1975) continous ghee was prepared by melting the butter in a tank following by centrifugal separation of the moisture. The concentrate was then subjected to three successive stages of heating in SSHE and vapour separation. Finally, the ghee residue was removed from the product by centrifugation separation process and product packaged employing fully mechanised form-fill-seal equipment (fig.2) In another process patented by Abichandani et al (1986) more compact forms of SSHE and vapour separator system were employed in the process.

Continuous Khoa Making Plant:

At least three versions of continuous Khoa making equipments have been successfully developed so far. At the National Dairy Research Institute, Karnal, Aggarwal et al (1986) patented a process where double jacketed conical vat was employed for concentration of milk. Larger diameter of the cone on the top helped prevent foaming of milk during boiling / concentration process. At the end of concentration, the product was removed using the Archimedes screw impeller pump. In another equipment design and patented by Abichandani et al. (1986), a thin film SSHE was employed for the concentration of milk in a single pass for the production of khoa. This plant has been tested under commercial conditions at many industrial locations and is being successfully used by many dairy plants for mechanised production of Khoa. In another process patented by Punjrath et al (1990) an inclined surface heat exchanger was employed for the production of Khoa. Concentrated milk is used as the incoming feed material and khoa discharge into cooling trays before preparing the final product (fig. 3)

All the attempts that made so far for mechnishing the process of Khoa making do not permit rapid cooling of the product. If intermediate cooling was attempted by spreading khoa in flat trays under ambient conditions, possibilities of recontamination loom at large. Logically, it should be possible to prepare the end product, such as burfi, peda etc., in a single pass continuously from in coming milk directly from milk utilising any one of these equipments for mechanised production of khoa. It is worth mentioning here the experience generated at Sugam Dairy Baroda where Rheon (Japan) packaging equipment for blending and processing of khoa with various ingredients for mechanised production of burfi and peda has been used.

Industrial Process For Gulabjamun:

In a very imaginative approach, Aneja et al. (1980) developed the concepts of utilising various equipments from food industry for performing intermediate unit operations for mechanised production of Gulabjamun. In a planetary mixture, dried milk was mixed with other ingredients to prepare the dough. Gulabjamun balls were formed by employing a portioning machine adapted from meat ball forming equipment. Well formed balls were given final shape and glossy surface by rolling under rotary motion imparted by flat plates attached to a rolling machine. Balls were deep fried in continuos dough-nut frier and floated in a continuous sugar syrup soaking tank. A unique form,

film seal equipment eventually packed a pre-determined number of Gulabjamuns in sugar syrup in the polystyrine cup employing a form-fill-seal machine (fig. 4).

Industrial Shrikhand Making process

In a process developed by Aneja et al. (1980), a fully mechanised / continous process for Shrikhand making has been developed. Three commercial plants employing this process have been established at Sugam Dairy Baroda, Warana Dairy and Mahanand Dairy. The process involved envisages standardisation of milk with regard to the fat and SNF content, followed by pasteurisation. Milk is then fermented in a process tank employing lactic cultures. The curd so set is separated employing a quarg separator and chakka. Further processing for mixing chakka with other additives, viz., sugar, flavour etc., is then carried out employing a planetary mixer. The product was packaged in polystyrene cans employing automatic form-fill-seal machine and the package is subsequently thermised to obtain the requisite shelf life (fig. 5)

Mechanised Production of Paneer :

Traditional process of paneer making is essentially a batch process, in which nearly half of the milk solids are lost with the whey, resulting in a yield of about 18%. Furthermore, the bactericidal advantage of boiling milk before coagulation is lost upon subsequent manual handling of the coagulum and treatment with water for cooling, thus limiting the shelf-life to about 3 weeks (4-6 C) at the most. In a fully mechanised / continous process developed by Rao and Mathur (1992), milk concentrated by reverse-osmosis / ultra-filtration to 30% solids level is processed by employing concomitant texturisation / sterilisation in polypropylene pillow pouches. Retention of milk solids in the products through this approach permits product yield in the range of 35-40% and shelf life of 6 months under ambient conditions (fig. 6).

RECOMMENDATIONS :

It is suggested that the future innovations must aim at integration of various unit process with newly emerging energy efficient technology. These design aspects must incorporate the element of sanitary design, and be adaptable for the good manufacturing Practices. It would be ideal to have the versatility of incorporating alternate solds of milk as raw materials. The final product must be confirmed to the sensory, physico-chemical, microbiological, and nutritional characteristics of the traditional product as established on the scientific basis as well as through test marketing in sensitive areas predominated by discerning consumers.

There is a need for policy intervention through government support to ensure the availability of adequate financial and scientific inputs for proposed development.

There is a need for undertaking an integrated approach and involve participation of R&D Institutions, equipment fabricators, end users, and financial Institutions.

There is a need to undertake R&D work for the development of environmental friendly packaging systems for the packaging of product obtained by newer processes / equipments.

There is a need for establishing National Demonstration Centre for undertaking testing, refinement and training of industry personnel in a cost effective manner.

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NUT-110 CPHE

TECHNOLOGICAL ASPECTS OF INNOVATIVE PROCESSING

K.C. Das

Silver Jubilee

Commemorative Syposium

Dr. B. N. Mathur

Joint Director (Research)

NDRI, Karnal - 132 001

Technological Interventions for Innovative Processing

Membrane processing

Reverse Osmosis

Nanofiltration

Ultrafiltration

Microfiltration

UHT processing

Liquid food products

Particulate food products

Technological Interventions for Innovative processing

Microwave processing

Thawing

Melting

Heating

Sterilization

Biotechnological processing

Enzymes

Genetically modified microorganisms

Prospects for High Quality Traditional Processed Foods :

STRENGTHS:

Technologies well established for cottage scale operations

Indigenous products have ready acceptability

permit significant value addition

Prospects for High Quality Traditional Processed Foods:

WEAKNESSES :

Lack of products profile on scientific basis : physico-chemical, microbioligical

Lack of equipments for performing unit operations involved in processing

Lack of packaging materials and machines

lack of quality assurance and labelling conforming to prevailing standards

Prospects for High Quality Traditional Processed Foods:

OPPORTUNITIES :

High purchasing power of middle class

need for safe and hygienically produced / packaged products

Export to ethnic markets

Conventional foods have short life cycle giving way to newer varieties of processed foods

Prospects for High Quality Traditional Processed Foods :

THREATS :

Products prepared by innovative technologies may differ considerably from traditional form

Cost of failures may be too high

Half hearted R&D and marketing promotion may not yield anticipated profits

Suggested approach for future innovations

Integration of various unit processes with newly emerging energy efficient technologies

Incorporation of elements of sanitary design in new equipments / processes

Incorporation of versatility of utilising alternate solids of milk as raw material.

Evaluation of final product through test marketing

Evaluation of New Equipments / Processes

Systamatic assessment of product quality based on physico-chemical, microbiological and nutritional attributes

Shelf-life test design conforming to international standards

Consumer acceptability through test marketing in sensitive markets

Recommendations

Ensure availability of adequate financial and scientific inputs for proposed development

Integration between R&D institutions, industry and financial institutions

Development of Environment friendly packaging systems for newer processes/ products

Establishment of National Demonstration Centres for testing, training, and refinement

Second Technical Session

Topic: Quality Aspects of Milk

Chairperson : Dr. H. Chenne Gowda M.D. KMF

Speakers: 1.Microbial quality aspects of milk from cow to consumers in relation to Indigenous products by Dr. A. M. Natarajan

2.Chemical hand shake among milk molecules to influence quality of milk

by

Dr. N. C. Ganguly

Chairman : Mr. Chennagowda

Thank you Dr. Shanker and, distinguished delegates.Now the speakers have already been introduced to you. I have got two eminent speakers both on my right and left side and the subject chosen is very much relevant today. Although we are number two in milk production after USA, in terms of export of milk and milk products we have certainly got some constraints in terms of quality. Let us accept this fact that without improving the quality we cannot do anything on the product for the purpose of export. Just to give an example, the KMF (India) is the 3rd largest federation in the country and number one federation in the south India. When we had plenty of these products, butter and ghee just about three years back, enquiries were coming to the federation not only from the Middle East but also from the European countries. Looking into the enquires pouring into the federation we were all very happy that we were going to utilise all the stocks within no time. When we actually sent the specification, not even one sample was approved for the purpose of export. In this context the quality of milk right from udder to the consumer is very much important. With this small brief I request Dr. Natarajan to give a talk.

Conclusion:

Thank you Dr. Natarajan. Indeed it was a very good talk, speaking about the quality of the product and taking care of how the product is going to be improved and in fact there should not be any compromise on the quality of the product. This is one of the reasons why I told you in the beginning that quality has to be improved at the udder stage itself. Indeed in the paper presented by Dr. Natarajan we can all see how much the men and material contribute to the deterioration of quality. He mentioned that milk pails etc. Contribute to 60% of bacterial growth. Thank you.

I invite Dr. N.C. Ganguli, as you all know that we require no introduction about Dr. Ganguli and his experience and about his talk. Hence this talk is very interesting and I request him to complete in 30 minutes.

Conclusion :

Thank you Dr. Ganguli, we had a very pleasant talk by Dr. N.C. Ganguli. When he started his talk I thought he would talk about contamination with hand shake but ultimately when he heard him, the whole molecular world of milk was exposed. How this nature of milk molecules is going to effect the end product and how the technology should be careful about new molecules in milk and the characteristics are very important to the identification of new molecules in milk. It is very important from the point of view of going to traditional products. In fact he has thrown a challenge to the research people who take keen interest involving the chemistry of the milk. With this I thank Dr. Ganguli and Dr. Natarajan and also thank K.C. DAS (P) LTD., and the organisation to provide me with the opportunity to preside over this session.

TOPIC : MICROBIOLOGICAL ASPECTS OF MILK FROM COW TO CONSUMER

By : Dr. A.M. Natarajan.

Consultant

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Introduction :

Dairy development in our country in terms of milk production has made rapid strides in making the country the the second largest milk producer in the world through the efforts of Operation Flood program. Milk and milk products form an important part of Indian diet. Traditional products are an important part of economic, social religious and nutritional aspects of the Indian masses. Nearly 50% of the total milk production is utilised for preparation of different traditional milk products including indigenous sweets. Production and marketing of the traditional dairy food is carried out by small scale entrepreneurs using their own technology in batches. The products are often prepared using milk of inferior quality and employing unhygienic practices without proper packing. As a result, the chemical composition shows variations with unsatisfactory microbiological quality. Though we have achieved a substantially high milk production, not much has been done to improve the bacteriological quality of milk.

Quality of milk received at the dairy particularly in summer months is generally very poor and also there are large incidents of Cob positive cases resulting in rejection of milk. Milk is a highly nutritive food for both human being and microorganisms. Further milk gets contaminated from various sources, from production upto processing stage. As a result of this, microorganisms in milk mulitiply at the end of every hour (average) resulting in increase in their numbers to reach a population of 80-100 million/ml, at which point the milk is likely to curdle.

The organoleptic changes can be detected when the number of microorganisms is above 5 million/ml in uncooled milk and 1 million/ml in cooled milk. These limits are only general indications which are dependent on the balance of the microflora and on the multiplication rate.

Due to growth of micro organisms, lot of changes occur in milk releasing metabolites from lactose, protein and fat which imparts off-flavours to the milk. Besides this, it is likely to affect the texture and yield of the final product, in case of channa based sweets i.e. Rossogolla, cheese etc.

Profile of microbial contamination :

Fresh milk contains very low bacterial count. The milk subsequently gets contaminated. There are various sources of contamination to milk at the production level. Among the major sources of contamination includes improperly washed pails and cans accounting for 49%, dung and flies 30%, personal hygiene 5%, filter cloth 10%, normal udder less than 1%, udder infection 5%. Above all, the most important step in the handling of milk is holding milk at room temperature and exposure of milk to the atmosphere while delivering milk to the society. At the end of 3 hours holding at room temperature, the bacterial count would reach a population around 5 million/ml from 2.5 million/ml an hour before. Saving at least one hour in holding would save 2.5 million/ml bacteria which accounts for 50% decrease in the number.

One of the effective methods to control the extensive microbial growth in milk is to chill the milk immediately after production and hold at that temperature till it is despatched to the processing dairy. Some federations have introduced chilling of milk by establishing chilling centre followed by transporting milk at low temperature

Thereby improving the MBRT time of milk received at processing dairy from 30 minutes to 2 hours.

Cooling of raw milk should not be considered as a substitute for unhygienic milk production.

Microbes causing health hazard :

Another important factor from the point of view of health hazard is the presence of large number of enteroptoxin producing strains of certain species namely Staphylococci aureus and Bacillus cereus, the toxins of which cannot be eliminated by boiling or pasteurisation.

These two organisms are of common occurence in unhygenically produced raw milk. Though other pathogens are also present in raw milk. They are destroyed by pasteurisation of milk.

The consumer demand safer food which has longer shelf life. Products have to be absolutely free from pathogens, toxins and other xenobiotic substances which are likely to create ill effects on human health. Therefore it must be more efficient in introducing process technology to prevent pathogen contamination right from the farm level to dinner plate.

Effect of bacterial spores in raw milk :

In any processed food industry, presence of bacterial spores are most important since these are likely to survive the heat treatment employed in the manufacturing process. The major source of spore formers are mostly from dust, dung and soil. This has to be prevented effectively to avoid spoilage of processed food during storage. This has got relevance usually in channa based canned foods namely Rossogolla, wherein Channa balls are boiled in sugar syrup for 15 minutes. Only spore forming bacteria can survive this heat treatment and would subsequently grow during storage at room temperature. Hence intial spore count of raw milk would influence the shelf life of canned rossogolla.

Sources and quality of milk supply :

Milk for preparation of channa based sweets are procured from two sources which includes organised dairy farms and contractors. Majority of the milk supplies are from organised dairy farms. In the beginning a lot of problems were encountered in the manufacture of good product due to poor bacteriological quality of milk used particularly from the contractors. The total bacterial count of milk supplied ranged from 8 million to 12 million/ml with high incidence of bacterial spores to the extent of 2000 organisms/ml and low incidence of staphylococci organisms and with complete absence of clostriduim. The quality of rossogolla prepared was found to contain total bacterial count of 1200/ml with complete absence of coliforms, staphylococci and clostridium. As per the BIS Standards the limit for total bacterial count is 500/g for Rossogolla. The Shelf life of canned Rossogolla was found to be 10-15 days at Ambient temperature.

However the microbial count of Rossogolla did no affect the quality of the product for the day's consumption.

Methods tried for increasing shelf life of canned rossogolla :

In order to increase the shelf life of canned Rossogolla we carried out a series of trials which showed improvement in the microbiological quality of raw milk, resulting in increase in the shelf life of canned Rossogolla. This was achieved by carrying out clean milk production at one of the organised dairy farms who have been supplying milk for the past 25 years. The milk obtained was cooled immediately and transported to the unit resulting in drastic reduction in total bacterial count to 50,000/ml with almost nil spore count. The product manufactured using this milk gave a shelf life of the canned rossogolla of more than 6 months at room temperature and 2.5 years at 8-10 C withought any significant change with respect to flavour, texture and taste. This method of using good quality raw milk with low bacterial count and spore count is being employed only for production of canned Rossogolla in milk, thus achieving very high shelf life. However use of chilled milk affected the texture of Rossogolla to a little extent.

Attempts were made by incorporating nisin at different levels in syrup of the Rossogolla. Use of nisin with 100 iu's improved the shelf life of canned Rossogolla from 15 days to 2 month at ambient temperature with total

bacterial count confirming to BIS Standards, which prevented the growth of surviving bacterial spores. Addition of Sorbic acid at 25mg/500ml effected in an improvement in the shelf life whenever the spoilage was due to yeast mostly entering into the container through leaks. Attempts were also made to preserve milk by L.P. System in order to improve the microbiological quality of raw milk from the farm without cooling. There was a considerable reduction in total bacterial count as well as spore count due to preservation by L.P. System. The canned Rossogolla showed significant improvement in the shelf life at ambient temperature. The texture of the Rossogolla was not affected by the chemicals used in the treatment of milk. The above methods employed to improve the bacteriological quality of raw milk has contributed significantly to widening the market for canned Rossogolla endowed with high shelf life at ambient temperature.

Some trials were conducted using milk collected by machine milking. The quality of milk obtained showed very low bacterial count as well as very low spore count. The bacterial quality obtained by using machine was reported to be relatively better than that from hand milking. Very low count milk can be produced with machine milking, has been shown repeatedly by adequate care of the machine. The canned Rossogolla gave a very good shelf life at ambient temperature. This method of obtaining quality milk has a very good application for handling large quantities of milk.

Apart from improving the quality of raw milk, application of HACCP would ensure production of product of high quality for entering into wide market within the country and abroad.

However given patience and understanding, quality controls may usher in an new peaceful era of productivity, quality and prosperity in the organisation in the interest of all. It is advised that the implementation of quality controls should be done as an integral component of total quality management (T.Q.M).

There are no two opinions that in the changing senario, the indigenous sweet industry need to commit themselves to total quality management in concept and practice not only for the growth but also for survival. During the past three or four years ISO certification, sought namely to gain access to foreign market is also receiving attention.

In order to achieve international standards and ISO certification three strategies are required to be adopted to improve the quality of raw milk. Mechanise the process and introduce better packaging for achieving overall quality of end product.

Conclusion :

1. Use of good quality raw milk is imperative to achieve increase in the shelf life of canned product. This could be achieved by collecting milk from organised dairy farms implementing rudiments of clean milk production at the production level, thus ensuring low incidence of total bacterial and bacterial spore count.

2. Addition of nisin to the syrup has contributed to improvement of shelf life of canned Rossogolla.

3. L.P. System of preservation of milk was found to be effective in improving the quality of raw milk and subsequently acheiving high shelf life of canned Rossogolla.

4. The milk collected by machine milking has shown tremendous improvement in the bacterilogical quality of raw milk which gave very high shelf life of canned Rossogolla.

5. Even though some lead time is required to procure better quality milk, efforts should start now for considering introduction of machine milking and premium payment for better microbiological quality of raw milk.

6. The industry should govern itself in quality control measures and improve its image in order to be ready to market the product of high quality and good shelf life.

CHEMICAL HAND SHAKE AMONG MILK MOLECULES

Dr. N.C. GANGULI

Formerly Professor of Eminence (ICAR)

Secretary, National Academy of Agricultural Sciences

M-76B, Malviya Nagar, New Delhi.

It is indeed a great privilege for me to deliver a talk on the quality aspects of milk when milk molecules are exposed to a variety of technological treatments in the manufacture of indigenous processed milk products.

I am further delighted to perform this exercise today organized by AFST(I) to commemorate the silver jubilee year of K.C. DAS (P) Ltd., for their quality performance in manufacture & marketing of myriad & prodigious milk products in the city of Bangalore of the last 25 years.

I am grateful to the organizers in identifying me and thereby providing me this unique opportunity of delivering my desired talk on this occasion.

A word on milk

Milk is a molecular organization of myriad unrelated families of nutraceuticals. The aquatic phase of milk provides the residential shelter to these classes of biological community. The lipid phase, on the other hand, takes care of the milk fat and related lipid molecules. Despite the molecular diversity in relation to their chemical properties, milk is an excellent example of "unity in diversity" with the motto of functioning together.

To a chemist, milk is a tapestry of major and minor chemical entities with the understanding of maintaining colloidal, hydrophobic and hydrophilic members having distinct structures and function. The suspended constituents comprise casein micelles and milk fat, and the soluble constituents are whey proteins, carbohydrate and minor components including vitamins.

All the community of chemicals present in milk originates in the mammary gland through distinct biosynthetic pathways. These synthesized molecules get intimately mixed with specific other constituents appearing from blood and finally secreted as total milk. Every class of chemical family, namely the proteins known as caseins, Alpha-Lactalbumin, Beta-Lactoglobulin, the carbohydrate lactose, the fats, minerals and vitamins present in milk, served as challenging starting materials for biochemists, technologists, biophysicist and molecular biologists engaged in dairy research. India is well known for its buffalo milk production, a milk with super fat and high calcium. Our group have characterized several distinctive features of buffalo milk proteins, fats and processing differences compared to cow milk systems.

About the title

It might be necessary for me to explain the new word which I call "Hand shake" among milk molecules for the benefit of the listeners. Every one knows the dictionary meaning of hand shake, which I have exploited to express the phenomena of partnership, interactions, co-participation and togetherness which occur among milk molecules when they are exposed to various types of technological treatments. In simple terms such phenomenon can be narrated under major types of hand shakes, namely physical, chemical, bio-chemical, bio-physical, technological, biotechnology and genetic engineering.

Hand shake inducers

In my opinion the various types of "inducers" of such hand shake between the chemical molecules can be classified as four types namely

a) Chemical expression b) Chemical reactions c) Microbiological transformation and d) Physical forces.

To narrate these events under chemical expressions, one can probably observe through various types of interactions (type A) namely electrostatic, colloidal, covalent, hydrogen bonding chelating, transesterification, co-ordination complexing, additives, stabilizers and emulsifiers.

The next type (type B) which are precisely through chemical reaction, would be hydrogenation, unsaturation, transformation and enzymatic reaction.

Milk Coagulation

It is needles to emphasize the phenomena of milk coagulation and its indispensable role in the manufacture of Indian dairy products and to this audience it might not be a piece of new knowledge. However, when I consider from the angle of "molecular hand shake", I feel there is a strong case for thorough investigation in-depth to trace the pathways of the molecules of milk participating in milk coagulation process. Such technological step can be achieved by four major types. Such as, Chemical coagulation, Enzymatic coagulation, thermal coagulation and Salt-Induced coagulation.

Now, I will attempt only to elaborate one such classical example, which exists in milk system.

The casein micelles, which we commonly express as colloidal particles, represent a variety of "hand shake" phenomena. Among them the most vital are the structural integrity, electrostatic interaction, hydrogen bonding, disulfide bonds, colloidal calcium - phosphate, serum caseins, serum salts. As the milk is exposed to different types of technological processing, the family of casein molecules undergoes several changes.

Looking to the complexity and organizational heterogeneicity, it is highly desirable to understand the milk molecules in the languages of its physical properties, physical equilibria, milk protein denaturation, milk clotting, milk fermentation and milk cryogenics.

INDIGENOUS DAIRY PRODUCTS

Before I begin on the impact of processing on Indigenous Dairy Products manufactured using Traditional Technology, I feel strongly that I should narrate the basic reasons why and how we started conserving our milk in the form of typical IDPs. I narrate this as follows.

MILK REFINEMENT FOR DEITIES

From time immemorial, ubiquity of milk and milk products as a vital component of Indian dietary menu, is an well-known phenomenon. Cattle keeping as a part of family by the Indian farming community has been a health promoting requirement, practiced till today. The tradition of cattle companionship is as ancient as the civilization and culture of India. Hence, preserving the excess milk at home became a necessity because of its perishable nature, applying simple technology based on common sense and environmental needs. The first of these milk products developed was dahi (curd/yoghurt), obtained by fermenting milk overnight. Dahi is today an essential health-friendly part of the Indian daily meal. With time, the production of myriad traditional milk products have burgeoned as a basic need to fruitfully utilize the milk from staggered production in remote areas, regional/ seasonal surpluses, difficulties in transport/marketing, thus protecting the milk molecules from vulnerable outside attacks. Till today Milk, Honey, Butter and Ghee are revered as highest form of refinement in the

aesthetic and nutritional context, and offered to deities as worship and expressions of gratitude. This is the way I look at it.

The Major Dairy Products

Type 1: Coagulated Products - Channa and Paner.

Type 2 : Fermented Cultured Products - Dahi, Lassi, Misti-dahi.

Type 3 : Fat-rich Products - Ghee and Makhan.

Type 4 : Concentrated Products - Khoa.

Technology used

The above mentioned four classes of Dairy products narrated, the types of Traditional technologies which are being adopted for time immemorial and improved with the passage of time, are summarized below :

TECHNOLOGY USED IN MANUFACTURE

	Indigenous Dairy Product	Technology used
I	Coagulated Product Channa & Paneer	Acid precipitation Thermal Concentration Filtration Coagulum Processing
II	Fermented Cultured Products. Dahi, Lassi, Misti-dahi	Thermal Concentration Cooling. Culture addition Incubation processing
III	Fat - Rich Products Butter and Ghee	Skimming Churning Thermal Clarification Filtration
IV	Concentrated Product Khoa	Thermal Concentration

Technology Dependence

Let me now concentrate my presentation on the theme of the Symposium "Integration of Modern and Traditional technologies". Since elaborate presentation on the subject cannot be possible due to time constrains, I would like to highlight both the use of modern technology and traditional technology from various angles with the intensions to integrate two technologies for the manufacture of quality processed foods.

In my opinion while we intended to improve our traditional technlogy using the modern technological approach, in no way we can do it, at the cost of the quality of the product. There cannot be any compromise in such issue. Hence, the introduction of mechanization for the production of such IDPs, must take into consideration the following points: it should be from functionality, nutritional, marketing, molecular, preservation, consumer and quality Standpoints.

When we do so there would be obivious need for a planned investigational requirement through research on the following aspects :

1. Health of the molecules 2. New generations molecules 3. Envirnomental considerations 4. Molecular co-operations 5. Molecular chaos 6. Molecular riot 7. Molecular restructuring.

Bioactive molecules

(a) Present in natural milk

While discussing the fate of the milk molecules during milk processing, particularly using traditional technology we have not given due weightage to the status of the bio-active molecules present in natural milk, from the angle of bio-fuctionality. Some of these molecules are Lysosyme, Lactoferrin, Lactoperioxidase, Xanthineoxidase, Opioids, Pigments, Cartenoids, Endogenous enzymes (50+), Hormones (15+)

(b) New Generation molecules :

As a result of different types of technological processes used for the manufacture of Indigenous tradition products, many of the "parent" molecules give rise to new "off - springs". A systematic study on the identification, isolation and characterization of these new generation molecules, deserve intensive attention which might qualify our milk products as "health friendly" or some of its can be "health-anti", which we do not know and deserve immediate exploration. Typical example can be the flavouring components in ghee, in fermented milk and products of Millard reaction and CLA (Conjugated Linoleic acid) and so on.

Monitoring of technological induced changes

Freshly secreted normal milk has its own "molecular networking" to maintain its natural character. From the above narration, it is evident that the molecules undergo transformation not only through the above types of phenomenon when exposed to technological processes, but also re-orient to entirely different type of molecular networking design. Such design is of course dependent on the type of technology used. With a view to monitor any re-arrangement in their original molecular network, I had the privilege to evolve a new monitoring procedure to detect such change using the light reflection property of the total milk system. This work was carried out while I was with CSIRO LABORATORY MELBOURNE, AUSTRALIA, in 1991. The principle of the method we adopted is the "colour communication" by milk molecules. The reflection of the incident light on milk system was measured accurately using chromameter. We could determine the light reflection and ascertain the purity of milk, dilution of milk, mixed milk, heated milk and so on.

I strongly feel that this monitoring procedure would be highly useful to trace the molecular re-arrangements in milk systems subjected to different types of technological treatments. The beauty of the monitoring system is that it is a nondestructive method and does not need any chemical processing of the milk or its products before analysis.

Water as a pivotal player

While handling milk we very often forget that we are handling 85% (approximately) water. Most of our technologies, and more so our traditional technology, when applied, our main objective is to remove water. To do so, milk is transformed to a new product in which water is a permanent molecule in association with all other milk molecules. Milk can sometimes be described as an "aquarium" having milk molecules as its residents, like in other food systems. Water in milk also carries out two major functions, namely "hydration" and "hydrolysis". Hence, "milk longevity" depends on these following factors :

The water level, microbial population, temperature, anhydration and molecular symbiosis.

More attention is required to evaluate the "water activity" during technological processing so that we can appreciate the role of water in a profitable manner.

FUTURE FRONTIERS

As an epilogue, I would like to propose the following recommendations as a microcosm for the "future pathway"

of research investigation on the traditional milk products in relation to specific processing exposures :

1. An in-depth investigation on the "original" and "new-born" molecules.

2. Identification and characterization of the "new born".

3. Evaluate their mechanism of "process-induced" formation.

4. Are all "off-springs" health-friendly or health-anti?

5. Can we regulate their appearance through the process control systems?

Thank You.

Third Technical session

Topic : Additives & Protectants

Chair Person : Dr. S.S, Arya Director DFRL Mysore

Speakers : 1) Value of Traditional foods in Nutrition

By P. Vijayalakshmi Professor & H.O.D. Avinashilingam Home Science College, Coimbatore.

2) Modernisation of Traditional Technologies for production of Quality Indigenous foods

Dr. (Mrs.) D. Vijaya Rao, Head Food Technology DFRL Mysore.

Thank you Dr. Shankar. As you know we have two very eminent speakers who will give us details specifically and therefore i will keep my comments for the end. Now I invite Dr.Vijayalakshmi Purushotam to proceed on her talk.

The Haldiram and the Bikaner Rossogolla do not enter the market in summer. The consequence could be that the whole of north India would be starved. There are so many marriages taking place but the entire market depends on the Rossogolla or the champakalli and the traditional Bengali sweets coming from Bikaner. The entire market is flooded not by the traditional canning industry but by the innovative canning industry with a shelf life of about 15 days to three months. They are packed in 18 litre tins by adjusting the strength of the syrup. I have first hand experience as have tested and eaten and they are excellent in the market. Probably before Haldiram came to Delhi or south India and Nagpur and Bengal, the same type of industry was flourishing in Rajasthan (Jodhpur) sector and there is a considerable amount of export from that sector too. What Haldiram did was to market product in an innovative packaging material with an assured shelf life and in an assured quality and that is the success story. We could prove that Yes! this is the product which stays in the market and competes even now with the multinationals going to that sector. Therefore it is a sector of identification of business activity area in which there is a considerable amount of opportunity. We need necessary technology there should be considerable amount of industry activity and is expected in traditional sector as Dr. Parpia said in his inaugural address, what the organized sector is providing is hardly about 20-30% even in Potato chips industry. We are having so many giants yet we are manufacturing 20-25% of the potato chips which are marketed. The only thing is that it is not clear to which sector we are not being able to introduce science to in this sector and standardisation. The traditional manufacturer of Halwai, the small scale manufacturer does not have means to test the quality of oil before it could be used we need to educate the manufacturers as well as the consumers. HACCAP concepts should be introduced in order to compete in the International market. Even the consumer as to make sure that he purchases the oil with ISI mark and color should not be the criteria for buying an oil as it could be adulterated. There as been considerable research done in this direction especially where the traditional food is considered. The scientific community has a responsibility as far as educating the end user. The Halwai probably purchases a sodium metabisulphite and adds, based on his experience, in syrup manufacturing process, when he prepares Ladoos and Jelleebes etc. Some how he does not know the amount of sodium metabisuphite to be added. I think the ministry of food and processing along with the AFST(I) and other associations which are responsible to educate the consumer, take step in that direction and involve ourselves with traditional food manufacturers. There should be an effort to standardize a recipe in our laboratories. I still remember the Chapathi preparation in DFRL. We did not know how much sorbic acid we should add and we were adding 0.2 - 0.48% sorbic acid which was not permissible and not required. It was not clear why one should add too much sorbic acid and hence we decided to reduce. Know we are preserving the chapathi's by 0.1% sorbic acid, with a little bit of pasteurization treatment and also air taken in hygiene processing and with a small quantity of ingredients and thus we have increased the shelf life to 9 months. Similarly we have worked on the same amount of buffers, Pedas and Khoa and we are able to provide a shelf life of 3 months at room temperature by incorporating antimycotic agents and controlling the permeability of packaging materials. Often it has been found that we always have products which are going with packaging materials which may or may not give the right amount of protection . In case of products like Peda's there is 25% of moisture. The perfect barrier film is not available which is ideal as some amount of moisture must migrate out so that the product doesn't get brown. That probably needs standardization to be done. As Mrs. Vijaya Rao said, in case of fried products we should give the best packaging material and the right type of additive which gives and maintains the crispiness and the right type of antioxidants to give some amount of shelf life to it. It will go a long way in improving the quality of traditional foods. I Thank the AFST(I) and Mr. K.C. Das and others to the oppurtunity to preside over this session. I also thank the Bangalore chapter, which has done tremendous and wonderful sessions.

VALUE OF TRADITIONAL FOODS IN NUTRITION ***

Rajammal P. Devadas*

Vijayalakshmi P.**

* Chancellor : Avinashilingam Institute for Home Science and Higher Education for
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*** Paper presented by the Chancellor in the commemorative Symposium on April 4th at Bangalore for the Association of Food Scientists.

Indian food industry is a sunrise industry with emphasis on culture, tradition regio - specific agricultural production and cost effectiveness.

Traditional foods in India have a rich heritage of multidimentional culture. These foods have been developed over centuries mostly through trial and error and they have contributed immensely to our nutrition and well being. The Indian housewife has been the sole custodian of these foods and regionally grown raw materials have been used in consonance with different cultures and dietary needs.

We have a treasure of traditional foods in India. Some of the most popular traditional foods in Southern regions of India are presented in Table I-

TABLE - 1 TRADITIONAL FOODS OF SOUTHERN INDIA

Andhrapradesh	Karnataka	Tamil Nadu	Kerala
Karevepaku Podi		Adirasam	Naranga Achar
Fish Pickle	Bisibelebath	Cheedai	Nellikka Achar
	Vangi bath	Idiappam	Kolliupperi
	Obbattu	Kolaputtu	Sarkaraperi
	Chakkali	Kambumavu	Adapradhamam
Vadialu	Badam Feast	Palkolukattai	Aviyal
Chegodilu	Adai Dosa	Pongal	
Gatti pakodi	Methi paratha	Chola Dosai	Adapradham
Nuvulukaram	Sathu	Kanjeevaram idli	Achamppam
Kopbrikaram	Happala	Omapodi	Kpzhalappam
Putharekulu	Jamun	Paniyaram	Ellu Urunda
Gongura Chatni	Puliyogera		Aval Kesari
	Cheeroti		Unniappam

Though this is not an exhaustive list, if one looks at it, it is simply surprising to know what a treasure India has in such specialities. It is sad to note that these preparations are fast disappearing as the housewife of today has neither the time nor the skill to prepare these items. Therefore there is an urgent need to reframe this system and produce food items which have acceptable standards and long shelf life. So the time has come to apply modern science and technology for converting these traditional items into convenience foods and eliminate the drudgery involved in the preparation of age old traditional foods.

Traditional foods are also known for their wholesomeness, high nutritional quality and taste. Each region in

India has its own traditional preparations. Many of these food items have been included in Indian dietaries for their known beneficial effects.

Pongal, a favourite delicacy of South India is a traditional food preparation specifically prepared on the first day of the Tamil Month "Thai" in order to commemorate the harvest Season and to give thanks to "Sun God" for having given an abundant harvest. This is taken along with a curry, made with mixed vegetables of creeper variety and "mochai" (field beans). Sugarcane is a relished accompaniment of Pongal Celebration. A modification of the original Pongal is "Ven Pongal". In Kanyakumari District, another modification called "Uluntahan Choru" (rice with black gram) is relished with chicken gravy soon after paddy harvest.

Nutritive value of selected traditional foods is presented in Table II.

TABLE II NUTRITIVE VALUE OF SELECTED TRADITIONAL FOODS

Sl. No.	Name of the recipe	Amount* in g	Energy (Kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Carotene mg
1.	Aappam	100	447	6.0	13.8	2.44	2
2.	Paniyaram	100	303	8.2	51.6	1.68	161
3.	Ragi Vadai	100	473	3.4	151.6	1.94	161
4.	Dhal Adai	100	382	9.5	54.7	1.88	155
5.	Achappam	100	424	4.9	15.0	0.66	72
6.	Aval Kesari	100	232	3.4	74.8	3.44	130
7.	Malayala Adai	100	444	10.6	46.3	1.77	80
8.	Obbatu	100	493	7.9	22.5	1.97	177
9.	Cheeroti	100	240	4.0	76.4	0.46	162
10.	Bisi Bela Bhath	100	167	6.1	39.9	1.21	223

* Calculation done for raw ingredients

Wide range of traditional foods both fermented and unfermented have been popular in different regions of India. These food preparations primarily consist of cereals and pulses contributing to about 80 and 10% respectively of the total caloric intake.

Some of the representative popular items of Tamil Nadu, Kerala and Karnataka are included in this table. Contents of this table reveal that on an average-all these items provide one fourth to one fifth energy requirement of an adult involved in sedentary activity. Items like paniyaram, dhal adai, malayala adai, cheeroti, bisi bela bhath supply almost one third of the protein requirement and reasonable amounts of calcium, iron and carotene. So it may be concluded that nutritionally these items are wholesome and no wonder our great grand parents who had included traditional foods in their daily dietaries were hale and healthy even in their ripe old age.

The traditional food preparations are not only the delicacies of everyday life, but also nutritious.

Tamil New Year's day is normally celebrated with Sweet Pongal, Ulundu Vadai and Payasam. In Andhrapradesh a special preparation made with neem flower, plantain, jaggery and raw mango is consumed by one and all to remind oneself that life is nothing but a mixture of joy, sorrow, bitter and sour experiences.

Special preparations known as "Kali" or "Koolu" made out of Ragi/Thenai/Samai/Kambu has been the speciality

of the rural populations of south India. In Madurai District this is relished with dry fish curry. Elsewhere in Tamil Nadu "Ragi Kali" is taken along with drumstick leaves curry/ keerai masiyal, "Kali" balls immersed in water kept overnight has been a breakfast delicacy with butter milk and raw onion. "Neeraharam", the supernatant water of this kali has been used as the early morning drink in olden days for its refreshing and cooling effect on the body during hot season. Neeraharams of Bajra kali is preferred for its cooling effect. "Neermore" (Butter milk), "Nongu", "Water Melon" and tender coconut water are the nature's gift for man specially for summer.

"Thenai Mavoo" with honey has been a delicacy of gypsies from time immemorial. In Kerala, boiled tapioca with fish curry has been relished over centuries. "Rice Kanjee" with green gram kootu is another traditional item relished by Keralites. These traditional items are not only wholesome nutritionally, but also contribute substantially to health and sensory satisfaction. Their nutritional attributes are noteworthy.

Once a girl attains puberty, she is given a raw egg, egg shell full of gingelly oil, boiled black gram balls with jaggery and gingelly seed balls daily for a period of seven days. The practice of giving these items is to strengthen her uterus. During pregnancy, mixed rice preparations are normally given as sour taste is relished by a pregnant women during pregnancy.

Soon after delivery, "Pilla Petha Rasam" containing ground paste of cumin seed, pepper, garlic, chillie, coriander seed, curry and coriander leaves mixed with tamarind juice is given in order to favour easy digestion. A spice ball of dry ginger, black pepper, thipili with palm juaggery and garlic are given to promote uterus contraction and breast milk secretion. Galactagogues namely dry fish, shark, drumstick leaves, garlic and cow's milk are often administered for their beneficial effect on breast milk secretion.

A special preparation of goat liver, lungs and pancreas (boiled with cumin seed and pepper) is given for its beneficial effect on the mother's health. Chicken soup made out of country hen with pepper and ginger is an age old preparation for nursing mothers.

Many of the traditional food items are also used for their medicinal effect on common ailments. From time immemorial, many food preparations are given for their curative effect. Some of these food preparations are given in Table III.

TABLE III TRADITIONAL FOOD PREPARATIONS USED FOR COMMON AILMENTS

Ailments		Food Preparations
Common Cold and Cough	-	Milk with pepper and turmeric powder
	-	Horse gram Rasam
	-	Honey with Pepper powder
	-	Chicken Soup
	-	Thoothuvalai Rasam
	-	Juice of betel leaf, salt and pepper
	-	Basel leaf extract
	-	Karpooravalli leaf extract
	-	Smoke of burning turmaric / black pepper.
Indigestion	-	Omam Water
	-	Ginger extract with lime juice

	-	"Chukku" Kashayam
	-	Soaked fenugreek seeds with buttermilk.
Gastritis	-	Asofoetide powder in hot water
	-	Garlic broiled in live coal
Diarrhoea / dysentry	-	Jilabee Jeera
	-	Broiled small onion
	-	Pomagranate tender in butter milk
	-	Panamkalkandu
Headache	-	Gound paste of mustard and dry ginger
	-	Paste of gelatinised ragi flour to be applied on the forehead
Fever	-	"Punaipagu" containing roasted broken rice, ravai, dry ginger and cumin seed prepared in the form of Kanjee
Blisters in the mouth	-	"Sukatti Keerai/fruit taken as such / or poriyal
Chicken Pox	-	Tender Coconut
	-	Panam kalkandu
	-	Montham Vazhaipazhalam
	-	Small Onion
Constipation	-	Poovam Pazhlam

Besides these facts, there is science in traditional food processing. During olden days, grand mothers without knowing any science projected the finest traditional technologies in their food processing. Smoked dried shark meat soaked in rice/black gram dhal washings has been a delicacy of Kerala for centuries together. Shark meat has 2-3% urea which is unacceptable both from the nutritional as well as flavour point of view. Research findings reveal that the washings of rice/black gram dhal contain urease which decomposes the urea of shark fish thus making the fish meat acceptable.

Jaggery is added to sweet pongal only after the rice is cooked as early addition will interfere with softening of rice. Though the actual scientific explanation was not known to our grand mothers, still they knew the drawback of early addition of jaggery to pongal. Now we know that jaggery being hygnocopic retain water and delay softening of the rice by delaying gelatinisation of starch.

Finally, traditional food consumed should be evaluated not as a single entity but as a whole with other accompaniments. The ill effect of one can be nullified by the beneficial effect of the other for eg. coconut oil has been consumed by Keralites for centuries. However, incidence of heart disease is meagre in Kerala probably due to the consumption of liberal amounts of fish and fish oil.

Thus traditional foods are not only tasty and indigenous, they are economical, nutritious and some of these preparations are popular for their beneficial and medicinal attributes.

Hence it is essential that the processing and prepartaion of traditional foods are made simple enough for the modern man and women so that, they can still prepare them. The following hints may be of use in developing traditional foods.

1) Traditional recipes should be standardized and techniques for producing quality foods, with an eye on emerging

large scale demand, be developed.

2) Necessary subsidies be given for producing traditional foods on a large scale.

3) Traditional recipies of different regions, already identified through the regional seminars should be standardised and given adequate thrust for production and popularization.

4) Product development and equipment design work be undertaken on priority, to place the traditional foods on sound economic, hygienic and nutritional foundation, combining traditional skill with emerging technologies.

Modernisation of Traditional Technologies For the Production of Quality Indigenous foods

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Introduction

Traditions are created by people in response to their environment and help to establish socio-cultural patterns of behaviour. The transformation of the primitive man from the hunter-gatherer to the cultivator of food is linked to the taming of the hostile environment spanning over two million years (Toussaint Samat et al 1991). In this time, food production and its processing and preservation kept pace with the advent and vanishing of several civilizations. In the historical development of Indian foods, the similarities of cooking pots and stoves and those of cooked foods used by us now and by the early civilizations of the Mohanjodaro - Harappa times were traced by Achaya (1994). According to the Vedas foods were classified into three categories viz., Tamasik Rajasik and Sathwik; each type of food was believed to confer certain physiological or behavioural advantages to the consumer (Kilara & Iya 1991). Accordingly the princes of the kingdom and the powerful and the highly placed brave warriors preferred the Rajasik foods and sages and the learned members of the community ate the Sathwik foods. Tamasik foods would cause anger or excitement, slothness or lethargy.

The Indian sub-contient was and still is host to so many parallel cultures and divergent traditions that it is an index of the total evolutionary development of its people. The traditional foods and their variety existing then and found now reveal the agricultural bounty and its diversity and the richness of the various geographic regions. These tell the story of the long established socio-cultural behaviour of the various ethnic groups which live harmoniously. The range and breadth in the variety and taste and flavour of the foods in use point to the native intelligence of the people and the latter's knowledge base. The people were aware of the possibilities of what could be achieved and done with the available produce. They had the inherent ability to adopt and the capability to modify and innovate on nature which resulted in the improvement of the nutritional status of the foods, better utilisation of the raw materials available, improvement in the enjoyment attributes and continuity of the traditions to percolate down the generations which now forms part of the cultural heritage of the country.

Popularity of Traditional Foods

Over the centuries, a myriad variety of traditional food types came into common usage. These foods are prepared with the indigenously grown basic foodstuffs (Table 1). Some of the sweet and savoury snack food types and beverages shown in table 2, although initially identified on geographical and regional basis, are now popular all over India and some have attained international status and popularity. Cross migration of cultures and of people has not only spread the name and fame of these foods, the latter are also being adapted and modified to cater to the taste preferences of the local groups and are being produced in large scale for sale all over the country.

Traditional foods form part of any social and family celebrations in which large scale catering to suit the regional taste are undertaken. Food served is considered to be the reflection of warmth, hospitality, status symbol and aesthetic sense beside enjoyment of satisfactory attributes.

How are these foods generally made ?

Traditional foods are prepared in home kitchens, or on cottage scale and also on large scale by specialist

caterers for retailing. They are also prepared in the streets and often sold out of vending carts. From one to several people are engaged in this type of food preparation without adequate infrastructural facilities. The owner-cook-supervisor has become skilled in cooking but possesses little knowledge about other food operations, hygiene and safety or quality of ingredients or proper packaging. Direct and daily sales do not need any distribution network nor storage at the proper temperature, since demand and supplies are satisfied. Most of the purchasers also do not concern themselves overtly with the "niceties" of cleanliness, safety, quality or packaging which are intrinsic to any attempt at modernisation.

Where can modernisation begin?

For large volume production, using mechanised, automatic or semi-automatic systems is one approach. Understanding the reasons for quality variation and hygiene failure can lead to the application of remedial measures which is another approach. Both these approaches in tandem will ensure consistent quality and safety. With modern marketing tools, one may elicit the consumer's views about preferences for taste, portion size, nutritive information expected and packaging and pricing. Modernization in packaging must take into consideration the effectiveness of the chosen packaging to protect the food from microbial and chemical changes when stored at the required temperatures. A well networked distribution system is another area in modernization to reduce delay time between manufacturing date and sale particularly in short shelf life products. Such a network also enables the wide scale marketing of popular and shelf stable foods.

Volume production

Two important factors could become important in the success attributed to large volume production. One is the reproducibility of the quality features and the other is suitably designed machinery which could be positioned in the flow line and which could either hasten the rate of a processing/cooking by continuous operation or process/ cook large quantities in a given time frame. Currently, traditional food preparation is an intensely labour oriented manual activity.

Pre requisites for consistent quality

Adequate product description is essential which includes quality parameters. Quality of a food item intended for repeated preparation and manufacture should be defined in terms of recognisable characteristics. Parameters such as appearance, colour, texture, consistency, taste and flavour are organoleptic properties. The type and quality of the ingredients used in the preperation of the food should be described. The propotion of each ingredient present should be mentioned. This is of course subject to variations and changes to give uniqueness and distinctiveness. This is important particularly when artificial flavours, colours and other additives are incorporated. In the absence of precise measures or instructions for preparation, the outcome of the effort rests entirely on the flair, instinct and ability or otherwise of the cook(s) employed for the purpose. Quality variations arise from this point onwards. To integrate the production of large volumes into a system of identified, stepwise operations, flow diagrams are required. For consistency in quality and reproductability of the distinctive features, the right type of starting materials/raw materials, semi-processed or fully processed intermediate ingredients should be found. It means identifying the quality suitable for preparing a specific food item and writing down specifications which could be adhered to while procuring them. Finding the right type of ingredients in sufficient quantity has been a problem in the food processing industry. Small scale manufacturers unknowingly substitute ingredient of a certain quality with another of unknown quality. This happens because of lack of understanding of the functional role of an ingredient and its effect on the end product. Some examples of quality criteria for ingredients which are important for obtaining stable, safe and high quality food products are shown in Table 3.

Relevant information could be disseminated through guide manuals and by creating a website giving access to

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basic data for homescale, medium scale and large scale production using the desirable quality of ingredients, possible sources of procurement and to identify problems in quality of ingredients and end products. And of course the scope of the website could be broadlined to include much more than this.

Integration of Tradition with Modernisation

Broadly speaking, the action plan for modernization of the traditional food industry could be considered on three levels (Table 4). Briefly described, it could take place.

1) By improvement in the agricultural sector : to encompass all primary produce

2) At the processing level : to provide the requisite space and construction for manufacture, skilled human resource, proper product description and process flow lines, good manufacturing practices and protection of the finished product.

3) At the market level : various strategies should take into consideration the retailer's facilities, the consumer's needs and behaviour and food handling and storage practices. Education of the consumer and the food seller are important in building up good consumer response and ensuring safety and quality of the food within the expected shelf life period.

Matching the Human Resource required for Modernisation

the Food professionals : What type of skills and knowledge are needed and who is imparting such training? The foremost requirement is for well trained food scientists, food technologists and food analysts. These people provide the backbone for modern developments to take place. CFTRI and Defence Food Research Laboratory offer courses in these subjects at the post graduate and some Universities have introduced related subjects at the undergraduate level. The students are trained to function effectively in food manufacturing and in R&D and quality assurance laboratories.

Informed Entrepreneurs : The food processor or the entrepreneur whose business instincts have been mainly responsible for the growth in food industry in India need to be informed of the basics of modern way of food processing, how to recognise and select proper type of raw material and ingredients, clean food handling and good manufacturing practices, the type of machinery that could be used etc. This would improve the awareness state of the veteran processors and help the first time entrepreneur doing it right from the beginning and to make informed decisions.

Trained Cooks : The preparation of traditional foods is an art by itself and highly individualised. Most people who prepare such foods are self taught through observation and experience or through family tradition. While conferring distinctiveness to their preparations, their very approach to food preparation could be the reason for inconsistency in quality and reproductability. People with flair should be specifically instructed in preparing food items according to standardised recipes, on how to choose proper ingredients and in the basics of safe and clean food handling with an eye to scaling up. Food craft institutes and hotel management and catering institutes have curricula to train people in basic Indian cooking, but the bias is more towards Western and exotic cuisine served in starred hotels. What is further necessary is to include training in traditional food preparation, particularly of those items which have very great consumer demand in different regions of the country and which have a rapid turnover value such as breakfast foods, snack foods, sweets and savouries, meal accompaniments and also all other traditional foods used as festive fare.

To be able to achieve this objective, we suggest the following approaches :

a) Compiling a regionwise list of names and descriptions of traditional foods of proven popularity.

b) Describing standardised recipes giving proper weights and measures of each ingredient to prepare the food in quantities ranging from 25-100 kg or more per day and identifying the type of ingredients to be used to achieve the desirable quality in the final product.

c) Include traditional cooking as an elective or special subject in vocational institutes like the trade schools, polytechniques and catering schools.

d) and consider the establishment of new institutions to impart training exclusively in the traditional and creative food preparation using the principles of food science and technology and nutrition.

Plant and Machine and Equipment operators : Modernisation inevitably leads to the use of processing machinery and equipments. To operate these and maintain them in serviceable condition, trained and skilled people are required. Who is doing this? No one apparently, because 1) a large body of unskilled labour shoulders the responsibility of volume production and 2) the hired people are trained on the job to operate the various mechanical and electrical equipments. There is therefore a great scope for training people to carry out various types of operations like canning, aseptic processing, chilling, freezing, dehydration, can making, pouch making, proper useage of sealers, carton making and strapping etc.

Fault detection, preliminary small repairs and above all preventive maintenance are not given due importance. Skilled people trained to do this will better job opportunities in the food industry and the manufacturers will certainly benefit by employing skilled and already trained people. The curricula in trade schools could be upgraded to include these instructions and a separate course could also be introduced to cover these requirements.

Food Handlers and Hygiene and Sanitation - Maintenance staff : Food handling practices in our country are in an appalling state of neglect and ignorance. A minimum literacy level and understanding of cleanliness is required of staff before they can be entrusted with direct food handling. Helpers in the preparation rooms and cooking/processing areas, those who have to manually do work like cut, mix, sieve, fill, move food items must be instructed in the proper methods of carrying out these operations. Where plant and machineries are used, cleaning in place (CIP) or cleaning each part separately and for ensuring good house keeping and good manufacturing practices, a separate class of people should be trained. Hygiene and sanitation play a very important role in food quality and which cannot be sidelined in the attempts in modernization.

Specialized courses in food and plant sanitation are urgently required.

Immediate Problem solving

Problem solving should precede attempts at modernization. Some of the areas which in the view of the authors require immediate attention are presented in Table 5. These are self-explanatory. These issues, unless understood, addressed and resolved are potential deterrents to the growth in existing markets.

Cues for Success

We have, in the traditional food scenario and specially that of the snack foods and convenience products and mixes, some resounding commercial success stories. Analysing how this was possible we find that there is a common thread running through the fabric of these successes. Some of these are :

i) Intelligent and informed selection of food items worthy of large scale marketing although there are a myriad variety of traditional foods and beverages.

ii) identification of the target group of consumers who need or want such products.

iii) Proper pricing based on market surveys

iv) Profit margins calculated on volume turnover.

v) Providing attractive packaging, some amount of product information for shelf stable items and clean and hygienic dispensing for perishable foods like confectionery milk sweets, pastries etc.

vi) Assuring a reasonable shelf life and apparent safety or quality commensurate with the type of product. This is done by employing knowledgeable and skilled people and technical experts.

vii) Familiar and highly acceptable organoleptic properties.

viii) and coping with the ebb and flow of consumer demand during different times of the year.

ix) Maintenance of uniform quality, consistency and taste.

x) Setting good standards and building confindence in the consumer.

Pride in producing such "low tech" and highly traditional foods for mass consumption and the basic innovativeness have led to part or full mechnisation in production in some instances. Rapid newworking and reliable chains or retail outlets have been formed to supply fresh stock uninterruptedly.

This is modernization of the first order provided that all such products are able to conform to the safety and quality standards and nutritional labeling requirements of international food quality regualtory bodies. These foods which possess distinct national identity will be identified easily and may be able to find global markets as brand identified high quality Indian traditional foods. This discussion has been restricted to a narrow range of foods falling into the "snacks" category. There are any number of other everday food items, which deserve to be examined in the light of possible modernization. More technical data should be generated to ensure success in scaling up for mass consumption.

No unlicensed production should be permitted and licenses for food manufacturing should only be granted after through inspection to see that GMPs are in place and that a periodic audit and review is conducted. Formulation of standards for various traditional foods also becomes an immediate necessity to safeguard the innocent consumer from misinformed purchases.

The keywords for modernization are : achieve excellence in recipe and taste, scrupulously controlled and therefore excellent production practices and total assurance of safety and thus of overall quality.

Since quality is not free, it should be at least made affordable and thus pleasurable. That will be modernisation of the second, third and nth order.

Table 1 : The Myriad Variety of Traditional Foods

Traditional Food Types: Snacks - Sweet, savoury / Festive Foods / Breakfast foods / Meal items Meal accompaniments / Desserts / Beverages / Appetizers, Stimulants, Digestives,Tonic properties

Traditional ingredients used in food preparation

Cereals, millets, pulses, fruits, vegetables, oilseeds, oils, milk and milk products, meat & fish, eggs, poultry, gur, cane sugar, palm sugar, cane juice, tamarind, green mango, lemon, kokum, coconut, spices and condiments.

Table 2 : Some Traditional Snack and Festive Foods known and used all over India

1.Savoury Snacks

North : Samosa, sev, spiced fried dal, papdi, chat, golgappa, kachouri, boondi puffed chaana and rice, pakora, chewda

East : Singhara, sev, puffed dals, flaked spiced fried dals, salted/spiced fried/roasted groundnut, chewda pakora.

West : Poha, batata vada, sev, fried dals, puffed chana/rice, dhokla, khaman, spicy roasted groundnut and cashew nut, pakora.

South : Chakli, murakku, sev, kodbale, boondi, fried mixtures, vada (many varieties), pakora, idli and dosa (different kinds)

2.Sweets

North : Jilebi, burfi, doodh pedha, kalakand, petha, pinni, halwa (many varieties), laddu, sohanpapdi, gulab jamun,, shakkar para, rabri.

East : Rasagolla, chamcham, sondesh and many milk sweets, halwa (many varieties)

West : Srikhand, puran pauli, sharr pauli, chikki, halwa (many varieties), ghewar, mango bar.

South : Coconut laddu and burfi, modaka, chiroti, pheni, boorey, arise, vobattu, halwa (many varieties), mango bar.

3.Light Meat Items

North : Puri and bhaji, chole and batura, kulcjha and chana, paratha stuffed, kheer.

East : Puri, bhaji, payas (many kinds)

West : Pav bhaji, stuffed chapati, kheer (many kinds), Fried rice.

South : Puliogare, chitranna, bisibele bhat, curd rice, puri and bhaji, chapati, payasam (many kinds)

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2) Indian Food - A Historical companion : K.T. Achaya. Pub Oxford University Press, Bombay, Calcutta 1994.

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Table 3 : Understanding The Importance of Quality in the Ingredients used in Food Preparation.

Importance of quality :	Some example where the quality of constituent Ingredients is important
Quality Specification :	Final moisture content e.g. flour, sooji, syrup strength in confectionery. Fruit maturity in pickle, jam, juice preparation. Fat content in milk channa, particle size, coconut maturity chemical residues, additives, ESL.
Role and Function :	Interactive reactions involving protein, carbohydrates, fat, moisture, sugars, acidulants, pigments, minerals, effect of heat, rheological properties, effect of order of ingredient addition, rancidity development, browning, discolouration, ESL.
Safety Issues :	Raw materials microbiology, pathogen type, effect of processing, handling, storage temperature, pesticide removal, temperature abuse, ESL

Table 4 : Integration at Three Levels

Agricultural Level	**Processing Level**	**Marketing**
Genetic selection	Design & Plan, construction	Distribution network
Improved varieties	Receiving place	Cold chain
Scientific farming	Machinery & equipment	Clean warehousing
Proper harvesting	Facilities for CIP and sanitation	Abuse prevention in retail outlets
Vacuum cooling	Utilities	Consumer awareness
Cold storage	Process control systems	Popularisation
Proper transportation	GMP	
	Trained and skilled manpower at all stages	
	Packaging	
	Transportation	

Table 5 : Where Problem Solving is Essential

1. Cleaning up the milk pasteurisation, filling and distribution system
2. Shelf life studies and packaging needs
3. Educating public to refuse highly coloured and unclean foods
4. Proper processing of spices
5. Help identify raw materials of good quality
6. GMP training and practice in production
7. Process standardisation for reproducibility
8. HACCP established for Safety

Fourth Technical Session

Topic : Suitable for the packaging of Indigenous processed foods

Chairperson : Dr. K.K. Iya DDG ICAR (Rend)

Speakers: 1. Packing, Economics & Engineering by Dr. H.B.N. Murthy Consultant.

2. Eco friendly packing materials for packing of Indigenous food.

Chairman: Dr. K.K. Iyya

Thank you Dr. Shanker.

May I without wasting any time invite the two speakers Dr. H.B.N. Murthy Dr. Aroop Sen Gupta and negotiate with them, though I know that I wont be successfull and I will allow Mr. H.B.N.Murthy first because I like the topic, Aroopsengupta on packaging.

I think they should take 20 minutes precisely and then I will wind up at 8.45 p.m. which means I have exactly 1 minute to speak with which I am very content. As you all know, packaging economics and engineering is very important because I like that subject very much and all the matters will be clearly dealt by Mr. Aroopsengupta on eco friendly pakaging materials for packaging of indigenous food materials. Thank you Dr. Murthy for saving time and presenting an excellent talk so that I can hand over to the chairman of the next session, sufficiently early. Those who are very keen for seeing the samples and discussing could sacrifice their time before dinner and discuss with the speakers, person to person. That would save time and certainly we are running out of time. But I like to thank both of them for their splendid presentations. While certain characteristics are outlined by speakers we have today the main focus on the Indian dairy sweets and I wish that someone have covered the suitability of these packages, packaging materials to a product like Rasmalai, peda, burfi, shrikand or whatever we have. There are two or three considerations, which I would like to discuss and place it before the audience before we go for dinner. Today the image of the Indian dairy products is very low. A pizza available in the market or a hamburger or a burger is a different type of food compared to hallwai made Mithai. You can imagine immediately when you get a peda or Jammon you will imagine a kadai and a man standing next to it stirring milk almost like it is like a gold gappa or other type of chat material. We must transform this Indian sweet industry to reasonably modernised handling materials with uniform quality, which will assure uniform quality and where the quality can be controlled at various stages. That will also have the effect of diversifying what is presently in the unorganised, 50-60% of milk produced in the country is handled by a hallwai where as it has to be an organised sector so that the dairies will and can diversify and make a product which can be made to HACCAP standards. There are at least two products in my mind, which require HACCAP not necessarily for export or WTO but for our own safety, which is the ice cream and the sweet industries respectively. In both of them the danger of pathogens and epidemic are very high. Now in such cases if you want to lift the image into a superior type of elite images that we consume at home on festive occasions, we have two options one is change the name and you will have to give it an exotic name for eg: instead of calling a peda give it an exotic name, I think the Bengali sweets have done a remarkable job, like for example Raj Bhog is an exotic name and you will have to invent similar different names that lift you into a different taste and experience.

It is like department stores which are increasing day by day, where people buy in bulk or accordingly to the requirements. However if you go around in your car around Janata bazaar, you buy a packet which looks attractive and has a reasonable good label, you get information about the product. Now therefore packaging is going to be very important, selectively and both economically sound. Now the milk product/dairy sweet are a high price product. Today in the festive season, it is not uncommon to find sweets at 200-250 Rs a kilo in urban areas. May be another

50 Rs less, in less urban areas. The prices of these sweets have gone up tremendously, and if you pay Rs. 250 for one kilo of sweets, I think the consumer deserves better packaging. Therefore I would feel the packing industry in the manufacturing industry itself might make a good contribution and good presentation to buy such sweets from open market which you will definitely go to that particular market. because even today as you want to gift a small packet of sweets to someone for celebration, you enter a shop, the ordinary package given to you is a cardboard packaging and of course many times the grease is left on the cardboard and therefore it is not a very acceptable type packaging for a packet that might cost you Rs. 60 to 70 for quarter kilo. Therefore I submit the packaging requirements for various types of foods might be different but for the Indian sweets we are talking today I think a very special effort must be done by the CFTRI, by the packaging consultants and packaging industries like Hindustan levers ltd., to cater to the needs of the special requirements to keep the image of the industry and achieve longer shelf life. If a thing has to be kept for a month or long and if it gets spoilt in a week it is bad. We arenot paying attention to the quality of the food. What is an ideal peda or ideal burfi to give that product to the consumer consistentantly from time to time again? Then that is the definition of quality. If the product is organoleptically, chemically, microbiologically safe then the sweet is an ideal one. Then the shelf life will automatically be good particularly if the packaging material is very good. Therefore I think the perspective on the Indian sweets needs to be raised to a higher level and our production will always consider and continue on hallwai that it must always be made available on lower levels, cost and all these things. This is my observation on this particular session. I like to thank Das Family and my special thanks to Mr. Biren Das particularly. It is a very significant 25 years in Bangalore. I think I'm not wrong. I haven't seen the Calcutta office, the dairy industry in general in Bengal, Mr. B.N.Das operation in the country will be one of the best in the country in that particular regard. He has got the support of a technical team available at all times and he has taken some time to take their advises and put it into action and effect at each time. Therefore the 25 years has been successfully utilised but not merely to complete 25 years but to raise the inputs of all the products manufactured everytime. That is a very happy tradition and I'm sure before the golden jubilee comes, we will see innovative developments with fine technology. Therefore, my congratulations and I wish all success to the organisers of the symposium and the seminar today.

Dr. Shanker and the AFST (I), Bangalore chapter team, I give hearty congratulations to them for thinking of organising a seminar supporting an entrepreneurs to develop better technologies through organising seminars and workshops and providing large amount of information on all aspects of products. I wish somebody did for other products also like eg. cornflakes. Why is Kellogg's the best in the market. In fact half a dozen packaging materials similar to that is available in the market and I'm told that quality is the same and I have tried comparing it also. I'm a regular cornflakes eater also for breakfast, but there is lot of difference in quality. Why is it based on quality that is not sufficiently available to other manufacturers need to be discussed today as we have discussed Indian sweets. I do hope the association will initiate such seminars on other products whether it is potato chips or corn flakes, noodles etc. With these words I thank the organisers for giving me the opportunity to interact with you.

Thank you very much.

I must thank the organisers and kedas family for giving me and my company HINDUSTAN LEVER, the opportunity to speak to you I have little quotesis because the subject which I will be speaking to you is a very controvertial one. There are lot of controversies but what I would like to share with you is the knowledge and fact that I have gathered during last 38 years in this packaging development area and would like to share it with you.

Because you are going through all subject and since this is a very structural presentation, I would like to pursue wide packaging and support packaging and then why ecofriendly packiging is required. In years of ecofriendly

packaging, how we can practice them. Some of the examples in Hindistan Lever is what we are doing, and it could be practised else where in the Industry too. To start with we must not forget that packaging is an integral part of the product. We must package the product which could be made available at the right time, right place and at the right cost, yet maintaining the hygiene.

The packaging should be more economical and affordable. It should also be ecofriendly and innovative.

Let us see what do we mean by ecofriendly packaging. Ecofriendly packaging is that packaging which have minimum impact to the environment. Environmental impact of packaging is measured by how much energy is consumed by its manufacturing process and during its use etc.

The task which we have in the Industry is whether it is an indigenous food or other food, is that we must devote minimum packaging material and eleminate over packaging, hence reducing the waste. This would be an ideal functional packaging. The functional part of the packaging must be used to pack the product. Incorporate recycle facts wherever practical without imparting the contamination of the food product. Consider refil pack which use very less quantity of packaging material and yet rigid in its charachteristics. We should place a symbol of recycling which is approved by Bureau of International Standards on the package. I will show you a how geometry plays a roll to reduce the packaging, Consumer should be encouraged to reuse packaging material wherever practical.

In our industry here we have been using a lot of pouches. They have been developed to save material, but why is the innovative mind not working further to save another 25% of material.

Talking about the tetrahedral thing, we have developed a tetrahedral tea bag which again consumes a less area of packaging material and hence it is more environmental friendly than a food cycle pouch.

Some of the initiatives of environmental friendly packing in Hindustan Lever is that we practice to reduce, replace, use and promote written end cycle. For eg. Tea, coffee and milk powder use line carton, with a liner. 63% of the carton is made from recycle board and every year we save 17,000 tones of bamboo and wood by using that recycle board.

We have introduced, TET containers for use with the concept of environmental friendliness. Now what is done is that when we use such containers you delay the waste going to the land field at a much later day and thus environmental friendly packing. The use of this concept appears in our government headline on plastic and plastic waste manual.

Here is a example of ecofriendly packaging development by ACLL who have instead of using corrugated box, combined a mosac sap paper and made a kilo pack which travels a distance of 100 Km with a 5 times lower cost than corrugated box. A lot of technology have gone into development of this.

You see what industry has done is that while we started with 12 micron material aluminium foil we reduced it to a micron, we encouraged development of 7 microns foil thickness used for tetra packs and in various packaging. Only 6.3 micron and further if you are always welcome to use metalisation which uses only 0.03 microns but will depend upon the shelf life of your product.

Here is a another new polymer technology which has come to see the right side and we are using this sealent for a poly pouch, or for a metalised pouch which was 37.5 micron a new catalyst which has come to the industry and now have been able to reduce the sealent thickness by 28 to 25% . This is the way you can reduce the impact.

In summary I can say that packaging is an integral part of the product. We have to first test the product and think of ecology friendly packaging with more hygiene and other convenience as when it concerns food product, it is more

important. All food products might be packaged for distinction throughout the supply. However the practice must be minimum usage of packaging material. Source reduction which is a practice of using least but adequate material must be a clean initiative. We must practice to reduce and replace what we use and we must promote other turn cycle.

PACKING ECONOMICS AND ENGINEERING

Packaging is generally defined as a means to ensure that the product whether manufactured or raw materials reaches the consumer in a sound condition. However, this function has to be achieved at minimum overall cost.

A package find its utility in the purpose it serves. It has a little or no intrinsic value of its own. It has to perform the major functions of protection, preservation and presentation where it is called for.

The cost of packaging depends on what we expect it to perform. For instance across the counter, a ready to eat food such as potato chips ;can be packed and dispensed in a simple polyethylene or poly propylene bag or Glassine Bag. However, the shelf life is limited. Whereas for long shelf life and wider area of distribution the packaging designed for potato chips should perform among others the following function:

(a) MOISTURE PROOFNESS	- To prevent sogginess
(b) GREASE PROOFNESS	- To protect against oil.
(c) OXYGEN BARRIER	- To prevent rancidity of oil.
(d) INERT PACKING WITH NITROGEN	- To ensure removal of oxygen from the packet and to give the chips crush proofness.
(e) BRANDING	- In a competitive market branding of the product is absolutely necessary with attractive graphics.

The other example of a common food product where the cost of packaging varies according to the shelf life desired is Biscuits.

PACKAGING MATERIAL	**TYPE OF BISCUITS**
1. WAXED PAPER	GLUCOSE AND CHEAPER MILK BISCUITS.
2. B.O.P.P. FILM	MARIE TYPE OF BISCUITS
3. LAMINATES OF	PREMIUM QUALITY BISCUITS
(a) POLYESTER POLY	CREAM BISCUITS ETC.,
(b) METALISED POLYESTER POLY	
(c) B.O.P.P. POLY	
4. ALUMINIUM FOIL LAMINATES	DEEP FRIED BISCUITS
5. METALIC CONTAINERS WITH	FOR LONG SHELF LIFE
ATTRACTIVE GRAPHICS	AND AS GIFT ITEM

With increased standard of living and with more and more women working outside the house, the need arises for speciality foods which offers convenience and also saves time. Among others, the type of foods are, Ready to eat foods, easy to cook foods, frozen foods and packed products which are micro ovenable.

The development of packaging materials and systems were catalysed by the U.S. army after the second world war since the materials available at that time were either rigid namely Cans and Glass bottles and flexible materials which were available with limited shelf life.

The post war period saw the increased consumption of petroleum products which resulted in more down stream by-products from the refineries. Scientists vied with each other to make good use of these products which resulted in the development of plastics and the current plastic age. The developments were most significant in the flexible packaging field. Packaging Engineers developed techniques to upgrade the flexible packaging materials to improve their functional quality and also developed suitable packaging systems for automotive packaging.

The packaging materials which could be tailored to have the desired functional properties could be classified as-

(a) Homogeneous Webs of pair or plastics

(b) Coated paper and plastics

(c) Laminates of various types

(d) CO-extruded plastics

(e) Plastic films with controlled rate of permeability to oxygen and carbon-di-oxide to preserve perishable fruits and vegetables, meat, & fish.

In addition to upgrading the flexible packaging material, the following packaging systems were developed by packaging Engineers.

SYSTEMS	MATERIALS PACKED
1.PRE- PACKAGING	Easy dispensing of products in provision stores and super market.
2.FORM FILL SEAL	Liquid Milk, Oil and Dry products.
3.OVER WRAPPING	Glucose Biscuits , Cigarette packets
4.LINED CARTONS	Tea, Refill Packs etc., for longer shelf life, these packs could be vacuum pack.
5.PORTION PACKS	Shampoo, Oil , Jam Scented Supari,sugar salt pepper etc.,
6.SHRINK PACKAGING	For bottle PP Seals, Labels and for bundling Unit packs.
7. SKIN PACKAGING	Poultry, Meat Fish etc.,
8.STRETCH PACKING	For utilising and House hold pack for (With cling films) wrapping sandwiches Roti etc.,
9.STANDI PACKAGING	Used for both dry and liquid products for attractive presentation, eg. Ghee and instant foods.

10.STRIP PACKAGING	Tablets, Supari etc.,
12.BLISTER PACKAGING	(a) For tablets etc., (b) Pre- formed transparent Blister packs are used for show through and cushioning .
13.INERT PACKAGING	Potato chips etc. (with Nitrogen)
14. VACUUM PACKAGING	Where long shelf life is desired
15. AESCEPTIC PACK	(a) Long life Milk Fruit Juices, Milk Beverages.
16.PRESSURE PACKS	Aerosols generally non- food occasionally used for dressing of Cakes and confectionery
17. COMPOSITE CONTAINER	Salt/Pepper Dispensers
18. MODIFIED ATMOSPHERE PACKAGES.	For foods and vegetables, fish and meat

The other areas where Engineers have developed techniques and equipment's cold storage, controlled atmospheric storage and sterilised packed food products with radiation and non-food items with chemicals.

As such with availability of suitable techniques for upgrading flexible packing materials and machines which offer various systems of packaging, the food technologist can increase the shelf life of perishable products and processed food products according to his requirements. The above techniques at times results in increased packaging cost. As such, the packing economics is directly related to the functions and shelf life desired.

In addition to development of unit packages, secondary packages and shipping packages, considerable progress has been made in methods of transportations. This has resulted in materials being made available at distant places in short period of time thereby enabling perishable foods in particular to be transported over long distances. To cite an example, refer containers are also available with controlled atmospheric storage. This further enhances the keeping quality.

Areas where the above developments could be used are in the public distribution system where the dry products could be prepacked to prevent contamination. Already oil is being prepacked and this could extend into items like sugar which are not washed before use.

Some of our traditional foods which are currently sold loose such as Puffed rice,Beaten rice are at times consumed as such. This certainly needs prepackaging to avoid contamination.

Thus the packaging economics is directly related to the functions expected from the package and not related to the intrinsic cost of the product.

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